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DISASTER ANALYSIS
POLICE AND FIRE DEPARTMENTS

Final Report #1 on Phase II

for

Federal Emergency Management Agency
Washington, D.C. 20472

Contract #EMW-85-C-1981
Work Unit 2651 G

March 1989

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University
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Delaware
NEWARK, DELAWARE 19716

SUMMARY

DISASTER ANALYSIS:
POLICE AND FIRE DEPARTMENTS

FINAL REPORT #1 ON PHASE II

for

Federal Emergency Management Agency
Washington, D.C. 20472

by

Dennis Wenger
E. L. Quarantelli
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The Disaster Research Center
University of Delaware
Newark, Delaware 19716

under

Contract #EMW-85-C-1981
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March 1989

The Disaster Research Center (DRC) over a five-year period is examining the disaster preparations and responses of most of the key organizations at the local community level. This volume reports the second phase of the work, namely the DRC study of police and fire departments in disasters.

Eight field studies were carried out with data being primarily obtained through intensive open-ended interviewing of key officials and by the extensive collection of documentary material from police and fire groups.

The first part of the volume summarizes the existing research literature on the disaster relevant aspects of local police and fire organizations. The literature is quite limited (only several dozen publications), and no systematic study has been made of the two groups for over a decade.

The second part of the volume presents eight detailed case studies of both police and fire departments responding in eight different disasters. This is followed by a presentation of generalizations divided into four general categories: predisaster structure, tasks and planning; organizational tasks during disasters; intraorganizational adaptations during the emergency time periods of disasters; and interorganizational changes that occur during that time period. Police and fire departments are analyzed separately, and special attention is given to the Incident Command System which is increasingly being adopted by fire departments.

Among the more important conclusions are the following. Fire departments have changed more than police departments in the last decade, taking on new tasks (e.g., EMS) and undertaking more disaster (as compared to everyday emergency) planning. The disaster planning for both organizations suffers from being almost exclusively focused on intraorganizational aspects. Police departments tend to restrict their responses during disasters to traditional tasks, and along with fire departments, withdraw from the situation as quickly as possible. While the police handle some of the disaster tasks well, they typically have difficulties in traffic and crowd control and in undertaking search and rescue when they respond to disasters. Fire departments do a good job in fire suppression, but they are often plagued with communication problems, mostly information flow, during the emergency time periods of disasters. Police and fire departments do not interact too well with one another during disasters, leading to coordination problems. The Incident Command System has some major limitations in certain kinds of disaster situations.

From these and other findings, a series of recommendations are made for improving the disaster preparedness planning and the disaster management of police and fire departments. Police department disaster planning particularly needs to be improved. Both police and fire need to more explicitly plan for disasters over and above their planning for everyday emergencies. Both departments should improve the

interorganizational aspect of their disaster planning, particularly with respect to one another. Police and fire groups ought to strengthen their links and interactions with other than police and fire organizations and particularly with citizen volunteers and emergent groups. The police have to better address how to stop convergence on disaster sites and should not assume that a more military model of operations will help their disaster management. Fire departments have to recognize that organizing and coordinating search and rescue during disasters is different in some ways from everyday search and rescue. Mutual aid agreements should be examined to see if they are fully applicable in managing disasters compared to everyday emergencies. The Incident Command System, while valued for certain purposes and groups, should not automatically be assumed to be best for all purposes; its use does not solve many typical interorganizational and overall coordination problems in community disasters.

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➤ during that time period. Police and fire departments are analyzed separately, and special attention is given to the Incident Command System which is increasingly being adopted by fire departments. (SDW) ←

Among the more important conclusions are that fire departments have change more than police departments in the last decade, that the disaster planning for both suffers from being almost exclusively focused on intraorganizational aspects, that the police have difficulties in traffic and crowd control and in undertaking search and rescue in responding to disasters, that fire departments have serious communication problems at times of disasters, that police and fire department interactions are generally poor, and that the Incident Command System has major limitations and its adoption for all disaster relevant purposes is not warranted by the research evidence. From these and other findings a series of recommendations are made for improving the disaster preparedness planning of police and fire departments and their response and managing of disaster situations.

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As is true of nearly all DRC (Disaster Research Center) publications, what is reported herein represents a collective product. Some, of course, contributed more than others, and at different time points of the work, but all persons noted below contributed directly or indirectly to this volume.

A substantial part of the data gathering and some of the initial analysis was undertaken by research assistants who were employed to work on the project. These included Michele DiPalo, Barbara Friedman, Laura Ketter, Sarah Kingsley, John Linn, Dorothy Lockwood, Lynne Snowden and James Wright. Undergraduate aides involved were Michele Klein and Stewart McKenzie.

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Also, many local community officials around the country, especially in fire and police departments, provided the information on which this report is based. The great majority were very cooperative and helpful. Because, as a matter of standard DRC field policy, the specific officials contacted were promised confidentiality and that they would not be individually identified in a personal way in any DRC publication, we cannot single any of them out by name, but we are grateful for their considerable assistance.

This report also follows the traditional DRC and scholarly policy of citing references and otherwise documenting what is reported. However, almost all of the examples and statistics used were derived or computed from primary data in the files of the Center. All unreferenced material, therefore, can be presumed to have been derived by DRC from its own data base.

Finally, since ours was the final decision on much of the data gathering and on all of the data analysis and report writing, any faults, shortcomings and errors in this report are our responsibility alone.

E. L. Quarantelli, DRC Director
Russell R. Dynes, DRC Co-Director
Dennis Wenger, DRC Co-Director

TABLE OF CONTENTS

ACKNOWLEDGEMENTS.....	i
TABLE OF CONTENTS.....	ii
Chapter 1. INTRODUCTION.....	1
Background of This Report.....	1
The Field Work.....	2
Field Research on Police and Fire Response to Disaster.....	5
Chapter 2. POLICE DEPARTMENTS.....	9
Previous Work.....	9
The Nature and Problems of Police Departments.....	12
Predisaster Structure, Resources and Disaster Planning....	13
Organizational Tasks During Disaster.....	17
Traffic and Crowd Control.....	19
Protection of Life and Property.....	20
Search and Rescue Activities.....	21
Warning and Evacuation.....	23
Intraorganizational Adaptations During Disaster.....	24
Alterations in Activities and Practices.....	24
Alterations in Intraorganizational Structures.....	28
The Authority Structure.....	28
The Decision Making Process.....	30
Communication Channels.....	31
Interorganizational Relationships.....	32
Chapter 3. FIRE DEPARTMENTS.....	36
Previous Studies.....	36
The Nature and Problems of Fire Departments.....	39
Predisaster Structure, Resources and Disaster Planning....	40
Organizational Tasks During Disaster.....	48
Intraorganizational Adaptations During Disaster.....	51
Interorganizational Adaptations During Disaster.....	54
Incident Command System.....	57
Chapter 4. BRIEF CASE STUDIES OF THE DISASTERS.....	61
Case Study #1: Explosion and Evacuation in Carbon Hill.....	62
Case Study #2: Gas Spill in Astor.....	66
Case Study #3: A Tornado and Flood Strike Bunkus.....	72
Case Study #4: Hotel Fire in Solara Beach.....	79
Case Study #5: A Plane Crash in Trotter.....	82
Case Study #6: A Fire and Toxic Spill in Richdon.....	88
Case Study #7: Planes Crash Over Norwood.....	93
Case Study #8: A Train Crash in Maxwell.....	100
Chapter 5. RESEARCH FINDINGS AND TRENDS.....	108
The Structure, Resource Base and Planning for Disasters.....	109
Police Departments.....	109
Fire Departments.....	113

Organizational Tasks During Disaster.....	116
Police Departments.....	116
Traffic and Crowd Control.....	117
Protection of Life and Property.....	120
Search and Rescue.....	121
Warning and Evacuation.....	122
Fire Departments.....	124
Fire Suppression.....	125
Search and Rescue.....	126
Warning and Evacuation.....	127
Intraorganizational Adaptations During Disasters.....	128
Police Departments.....	128
Alterations in Activities and Practices.....	129
Alterations in Intraorganizational Structure.....	132
The Authority Structure.....	133
The Decision Making Process.....	135
Communication Channels.....	136
Fire Departments.....	138
Alterations in Activities and Practices.....	139
Alterations in Intraorganizational Structure.....	141
The Authority Structure.....	141
The Decision Making Process.....	143
Communication Channels.....	144
Interorganizational Adaptations During Disasters.....	145
Police and Fire Departments.....	145
Local Police-Fire Relationships.....	147
Relationships With Other Local Organizations.....	149
Mutual Aid Relationships With Other Police and Fire Departments.....	151
Relationships With Other External Organiza- tions and Volunteers.....	153
Incident Command System.....	155
Chapter 6. CONCLUSIONS, IMPLICATIONS AND RECOMMENDATIONS.....	165
Research Conclusions.....	166
Police Departments and their—.....	166
Predisaster structure, resources and planning.....	166
Organizational tasks during disasters.....	167
Intraorganizational adaptations during disasters....	168
Fire Departments and their—.....	169
Predisaster structure, resources and planning.....	169
Organizational tasks during disasters.....	170
Intraorganizational adaptations during disasters....	170
Police and Fire Departments and their—.....	171
Interorganizational adaptations during disasters....	171
Incident Command System.....	172
Implications and Recommendations.....	174
For both police and fire departments.....	175
For police departments.....	176
For fire departments.....	176
BIBLIOGRAPHY.....	179

Chapter 1. INTRODUCTION

Background of This Report

The Disaster Research Center (DRC) at the University of Delaware in the fall of 1985 initiated work under Contract EMW-85C-1981 on a five year project focusing upon community and organizational response to natural and technological disasters. During the First Phase of the project where the work extended over a year, the DRC undertook a comparative study of the responses of local emergency management agencies (LEMAs) during the emergency time period of disasters. The Final Report on the First Phase of the work (Wenger, Quarantelli and Dynes, 1987) reported on both the extensiveness and effectiveness of the disaster response by LEMAs in six communities. An empirically grounded eightfold typology of local emergency management arrangements was developed, and the effectiveness of the various types was studied in relation to such variables as disaster experience, disaster planning and federal assistance. In general, we found a strong positive relationship between prior disaster experience and both the extensiveness and effectiveness of LEMA response. A similar pattern was discerned for prior disaster planning. In addition, we found that various forms of federal assistance can have positive, salutary effects upon local community response.

The Second Phase of the research has shifted the focus of study from LEMAs to local police and fire departments. As was the case in the work in Phase One, there are actually two distinct although related project activities, i.e., the field work on the organizations being studied and the work on the computerization of the DRC library

and data base. In this Final Report we discuss the major empirical findings we have generated with regard to the response of local police and fire departments to disasters; another Final Report summarizes our work on the DRC library and data base (see Quarantelli, 1989).

The Field Work

During Phase II of the projected five year effort, DRC focused upon police and fire departments in disaster situations. The overall approach of the research is to improve our understanding of the response of these important community agencies and to extend the rather meager body of literature that exists on their operations. During this phase of the work, DRC studied a total of eight disasters. The events included two airplane crashes, one train accident, three toxic spills or explosions, one major fire, and one natural disaster situation sequentially involving both a tornado and a flood. The eight communities that experienced these events displayed a range of police and fire operations. In four sites the local police and fire departments were very large and complex organizations, in three of the communities the local agencies were small, while one of the cities had forces of modest size. Therefore, although there was only one natural disaster setting, the communities did provide for comparative purposes a good range of types of local police and fire operations.

A methodological note.

DRC has engaged in quick response field studies of disasters for 26 years. The data gathering techniques used are primarily, although not exclusively, qualitative in nature. Heavy reliance is placed on obtaining data through intensive, open ended interviewing of officials

who are treated as informants, on the collection of organizational and community documents and statistics, and on participant observational findings. The first two data gathering techniques were particularly used in this study.

The eight disaster situations studied in Phase II were selected primarily upon the degree of local police and/or fire department involvement in the disaster. Actually we were able to study almost all of the major disaster events that occurred during approximately the year of work involved in Phase II. The communities ranged from small towns to major metropolitan areas and had corresponding differences in the size of their police and fire departments. Although only one natural disaster situation presented itself for study, the variety in the size of the departments allows for some significant comparisons.

DRC sent teams of trained researchers to the stricken community within hours of impact. A total of 192 tape recorded interviews were obtained; this total averages out to 24 per disaster. These interviews were conducted with local police and fire officials from all levels of the affected organizations. Chiefs, incident commanders, line personnel, first responders, and communication officers were interviewed in all of the disasters. In addition, DRC field team members carried out open ended interviews with a number of representatives of other community groups such as the local emergency management office, hospitals, the Red Cross chapter, local mass media outlets, relevant city departments and agencies, and involved county and state organizations.

Although the information obtained from the open ended interviews does constitute the most important data base for our study, it was complemented by what we learned from what DRC obtained in its document and statistical gathering effort. Among items collected were SOP/emergency/disaster plans, agency logs, after action reports, community and organizational planning documents, and voluminous mass media accounts. Following a modified grounded theory research methodology (see Glaser and Strauss, 1967; Strauss, 1987), the interview and documentary data were combined to write a separate case study of the operations of the police and fire departments in each of the disasters. The eight case studies provided the core material for our analytical work.

Throughout the analysis the focus was upon a number of critical dimensions. First, we examined the nature of the response of police and fire departments to the events. We looked at the effectiveness of their response in relation to such intraorganizational variables as decision making, communication flow, coordination, task performance, resource and personnel allocation, and authority relationships. Special attention was given to an analysis of the Incident Command System which was utilized in several of the communities DRC studied. We examined both successful and problematic aspects of the response. In addition, we looked at certain critical interorganizational variables, including mutual aid agreements, the utilization of volunteers and auxiliaries, and the nature of the relationships with other organizations, both within and outside the local community.

Second, we considered the effect of a number of variables upon the adequacy and quality of the organizational actions in the disasters. What factors affected how police and fire departments responded in the kind of community crises we studied? Among the factors considered were prior disaster planning, the size and resources of the department, previous disaster experience, and the nature of the disaster impact.

Third, we compared the different case studies across the board as well as with what had been earlier learned about police and fire department activities in disasters. Given our general observations from the empirical data, what larger implications could be drawn? Did our research findings relate to policy issues in police and fire department operations? What possible recommendations for changes in organizational disaster planning and response could be derived? In short, DRC was interested in drawing both theoretical and practical lessons from its research effort.

Field Research on Police and Fire Response to Disaster

Police and fire departments are perhaps the two most visible and involved local organizations during the early stages or times of emergencies and disaster; they are in the great majority of cases the first responding community groups. Within the United States there is a universal expectation on the part of other organizations and public citizens that these two departments will be rather central actors in the local response efforts. Being established organizations with disaster relevant resources, relatively clear domain responsibilities and high visibility, their involvement in emergency planning and

response is thought, probably accurately, as being critical to the community.

In this report we present the results of an empirical study of the planning and response of police and fire departments during eight disasters. Such a study is of significance because of an ironic fact. Even though, as noted previously, police and fire activity is crucial in disaster response, disaster researchers have paid relatively little attention to these organizations.

As part of this research effort, DRC produced an annotated bibliography of the social science research literature on police and fire department operations during community emergencies and disasters (Linn, et al. 1988). After an extensive search of the literature, a total of 50 research reports, monographs, articles, dissertations, theses, and working papers were found. More specifically, only 26 were concerned with police or fire operations during natural and technological disasters; the remaining 24 studies examined police or fire response to riots or civil disturbances. Of the 26 natural and technological disaster studies, but nine focused solely upon police departments and only eight examined fire group response. The remaining nine studies were of both police and fire activities.

Furthermore, the narrowness of our social science knowledge in the area appears even more striking when it can be calculated that the DRC has been responsible for producing 36 of the 50 works. Admittedly, the literature review did not include some important material, such as technical reports by firefighters and police officers, journalistic accounts, and manuals produced for on-line personnel. However, the

review did illustrate that social and behavioral science knowledge in the area is quite limited, and without the contribution of the DRC would be almost nonexistent.

Given this limited body of knowledge, how will we proceed? We begin with a separate discussion of the police and the fire organizations. This approach is necessary because, although there are many similarities in the structure and operational problems of these two organizations, there are also some significant differences. For example, police departments generally have full time personnel, whereas fire departments, in the main, have part time and volunteer personnel. Also, police groups generally are involved in almost any kind of community emergency, whereas fire groups are less likely to participate heavily in mass emergencies and disasters other than fire and hazardous materials incidents.

In the first part of this report, therefore, we discuss what is known about police and fire departments during disaster. In the case of each organization we briefly summarize the existing literature and discuss such issues as the following: predisaster structure, tasks and planning, organizational tasks during disaster, organizational adaptations during disaster, intraorganizational alterations, and interorganizational changes. The problems and difficulties that have been noted previously in the literature with regard to these issues are delineated.

This discussion of the existing knowledge base becomes the model or framework that is utilized later in examining the data gathered at the eight disaster DRC studied. Brief case studies of the various

disasters are then presented. The subsequent analysis partly focuses upon comparing the previously observed patterns and problems with the more current data. It has been more than a decade since any major, systematic studies of police and fire departments in disasters have been undertaken. We consider what changes, if any, have occurred. In particular, we examine the effectiveness of the Incident Command System in disaster operations, since it is one of the more significant changes which have occurred in preparedness planning in the last decade.

Finally, we conclude with a summary discussion of the major problems found and the policy implications of the findings. The reports ends with some general recommendations for the disaster related activities of both police and fire departments.

Chapter 2. POLICE DEPARTMENTS

Previous Work

Of all organizations within a community, the police department is most universally expected to have significant involvement in disaster relevant activities, regardless of the nature of the event. Obviously, this expectation stems from a number of factors, including the culturally defined domain and role of the police with regard to law enforcement and public safety, the relatively extensive personnel and material resources held by many local police departments, and the normal, visible, day-to-day involvement of the police in routine patrol as well as numerous limited emergencies and accidents. In fact, in combination with local emergency management officials, and often, but not always, the fire department, the police department tends to be a hub of organized activity around which community disaster response tends to swirl.

The literature on police activity during community emergencies and disasters is relatively limited. This statement is particularly true if only non-DRC studies are considered. The DRC annotated bibliography includes only eight studies or reports of a social scientific nature that were produced outside the DRC (Linn, et al., 1988). Furthermore, most of these works do not discuss disasters at all, but instead focus upon either general police activity (Wilson, 1968) or police operations during civil disturbances (Westley, 1957; Masotti and Bowen, 1968; Oberschall, 1968; Thompson, 1970; and Stark, 1972. Only the work by Bristow (1972) and by Leonard (1973) specifically focuses upon police operations in disasters. The latter

effort is a practical manual for police administrators that is aimed at improving disaster planning for a variety of hazards. The former is an analysis of police response to disaster that utilizes case studies and prescriptive guidelines to facilitate planning and response. This material, in combination with some information included in community preparedness studies concerning police response (Caplow, Bahr, and Chadwick, 1984; Wittenberg and Parham, 1984), constitutes the bulk of the non-DRC work on police.

The research produced by DRC is considerably more extensive. In the vast majority of the approximately 500 field studies undertaken by DRC, police officers have been interviewed. In a number of cases the local police department has been the focus of major research. There have been three major clusters of such organizational studies that have produced about thirty research reports, articles, or monographs.

The first set, done for the Office of Civil Defense (OCD), examined the activities of police groups in natural and technological disasters. One area of study involved a laboratory simulation of a city police communication center and the analysis of its task performance during both normal and disaster periods (Drabek, 1968; Drabek and Haas, 1969a; 1969b). Other research focused upon field studies of police preparedness and response to disaster (Tootle, 1968; Kennedy, 1970; and Kennedy, Brooks and Vargo, 1970). Still other of the DRC work examined the interrelationships between police and fire departments (Yutzy, 1964; Adams, 1965) or discussed the police and their activities as one component of the overall community response (Dynes, 1974; Warheit and Dynes, 1968). The major, summary volume

from this research effort, however, can be found in Kennedy, Brooks and Vargo (1969). This extensive and comprehensive work continues to represent the major findings of the DRC with regard to police department operations during natural and technological disasters. Its findings constitute a major part of the following discussion that serves as the model or framework for the present analysis.

In addition, DRC undertook a second set of observations and analyses of police activities in civil disturbances and riots. This research was broad ranging. It considered such topics as police planning for civil disturbances (Brooks, Dynes and Quarantelli, 1972; Kreps, 1973a, 1973b; Kreps and Dynes, 1974), police response to riots (Dynes and Quarantelli, 1970), police perceptions of riots and rioters (Ross, 1972; Dynes, Quarantelli and Ross, 1974; Quarantelli, Ponting and Fitzpatrick, 1974; Ponting, Fitzpatrick and Quarantelli, 1975), police community relations departments (Kreps and Weller, 1973), departmental organizational changes induced by riot experience (Kreps, 1973a) and structural and task alterations that occur within police departments during civil disturbances (Wenger, 1973). Although there are obvious differences in the response of police groups in consensus crises, such as natural disasters, and dissensus crises, such as riots (see Quarantelli, 1970 and Dynes and Quarantelli, 1976 for discussions of the difference between consensus and dissensus crises), this body of research does have some significant implications for the analysis of police behavior in natural and technological disasters. Actually police departments are more sensitive to, better prepared for, and more interested in civil disturbances than they are in disasters; a

not surprising observation given their general community mission of law enforcement (compare Kennedy, 1970 and Wenger, 1973).

Finally, some more recent studies of police departments were done in connection with the DRC research on planning for and response to chemical disasters (Quarantelli, 1984b). This research examined the nature of preparedness for chemical hazards and the relationship between local emergency response agencies, such as the police and fire departments, and chemical producers. In general, police agencies undertook very little preparedness planning with chemical companies, and/or for chemical disasters. They played a less significant role in responding to chemical accidents and emergencies than did fire departments.

This body of work provides the basis for the following discussion of police activity in disasters. However, in line with one intended objective of our five year project, the earlier research DRC undertook for OCD will be used as the primary comparative base source, in particular the summary volume by Kennedy, Brooks and Vargo, 1969 and Wenger, 1973.

The Nature and Problems of Police Departments

For purposes of exposition, we first discuss in some detail what is known about the predisaster structure and planning of local police departments. We subsequently summarize the major ideas existing in the literature about the responses of police organizations in disasters, particularly looking at their organizational tasks and adaptations. Certain interorganizational factors are also considered.

In discussing police departments, we primarily have reference to municipal police forces in moderate to large size cities (which were the focus of the earlier DRC research). Somewhat secondarily, we also discuss smaller police organizations and sheriff's offices. Also, unlike fire departments, where the response of such groups to everyday emergencies and community disasters is frequently not sharply differentiated, our focus in the following is directed primarily to the responses of police departments in community disasters.

a. Predisaster Structure, Resources and Disaster Planning

The predisaster structure of police departments tends to facilitate their involvement in disaster response, and their daily response to "emergencies" may facilitate response to disasters. (Emergencies are essentially the everyday, small scale, and minor incidents such as traffic accidents that normally inconvenience relatively few whereas disasters are the infrequent, large scale, and major occasions such as the impact of tornadoes that totally disrupt community routines.) However, there are limits to the transferability of these kinds of experiences.

Obviously, there is great diversity in the structure and complexity of local police departments. (In 1986 there were 11,743 municipal, 79 county and 1,819 township general purpose police agencies in the United States, who employed about a half million employees; see Report to the Nation, 1988:63). They range from the one person police force in small towns to megaforges of thousands in metropolitan areas. Actually, nearly half of all local enforcement agencies have fewer than ten officers (News Journal, 1989:A2).

While there is considerable structural variation, the functions or tasks of the various departments show considerably less variation. Basically, most city and town police organizations engage in five major line activities: patrol, traffic, detective, juvenile and vice. In addition, there is the general service and administrative component of the department and usually some kind of communication unit. In small size police departments, there will be considerable overlapping of these various tasks. For example, patrol and traffic functions may be combined and undertaken by the "uniformed force." In the larger organizations, each of these divisions may be somewhat independent and extensive, and there may be more specialized subunits within them.

In addition, most departments of even modest size have 24 hour operations involving three shifts. Therefore, they have two to three times more personnel available for action than they ordinarily use, which can allow for rapid mobilization of personnel during disaster response. The authority structure of the police department during normal operations is a "quasi-military" model (Kennedy, Brooks, and Vargo, 1969; Wenger, 1973). Although uniforms, rank, titles, insignia, and a pyramidal hierarchy seem to indicate that a military model of authority is operating, in fact, it is not (see Moore, 1988:10). For example, the individual officers exercise considerable autonomy and initiative in carrying out their duties; they do not work as a "team" in a platoon or division fashion. Decisions and directives from the organization that directly influence "policing behavior" come from a communication center through a dispatcher. This "radio room" is not high in the authority structure, but directs

departmental activity to a significant degree. Earlier DRC work has shown that this predisaster structure of authority can strongly influence police activity and is often altered during the emergency periods (Tootle, 1968; Kennedy, 1970).

Furthermore, police departments tend to have considerable material and human resources that can facilitate disaster response. Even small units are likely to have motor vehicles, communication devices, and facilities that can be useful during disaster. In larger communities, the resources may be extensive and become a central component in planning and responding to disaster. For example, the communication facilities that police usually command, and increasingly share and integrate with local fire departments, often become the central point for communication in many communities during disaster. In addition to their full time personnel, many police departments have a reserve pool of "auxiliary police" that can be an additional resource during emergencies and disasters, and which are often used in such situations. While the police are usually very reluctant to use volunteers for other than clerical tasks, the "auxiliary force," due to their predisaster experiences and legitimacy within the community, will be utilized in social control activities such as manning road blocks and redirecting traffic. (One major difference between police and fire departments is the dimension of volunteerism, with the latter often being staffed only by volunteers while the former are generally full time professionals).

Finally, previous DRC work found that police organizations do engage in planning for emergencies (instead of disasters). However,

the police often tend to develop a false sense that they can handle any disaster because of their normal emergency response mode. With respect to this matter, earlier studies found that planning was particularly weak for responses requiring interorganizational linkages. As noted:

Another important area of emergency planning, especially since police departments are the most widely recognized emergency-related community organizations, is planning for relationships with other organizations. Even when plans do exist, this is the area where difficulties are most frequent. Such plans often falter due to the difficulty of coordinating a myriad of community organizations; such a plan may even be ignored at certain stages. . . Planning is also inhibited by the fact that police departments often see themselves as the key disaster agency with the greatest capability and, they do not see the development of interorganizational ties as being crucial to their own operations (Kennedy, Brooks and Vargo, 1969:16).

Obviously, however, the existence of planning both within the department and across the community is a critical variable that must be considered in examining police response. Recent DRC studies of LEMAs have shown that planning can lead to a more effective response, as long as it is of high quality and views planning as a continuous, on going process, not just as the development of a document (Wenger, Quarantelli and Dynes, 1987).

In this present analysis we examine the impact of these predisaster factors upon police activities during the emergency time period of disasters. We assess the extent to which such elements as the time of impact, size and complexity of the department, resource availability or acquisition, mobilization of personnel, the traditional authority structure and the extent and nature of disaster

planning, do actually influence police behavior. We also examine other factors which might be especially important in the interorganizational relationships of police departments, such as common or joint planning, the operational experiences of working together during everyday emergencies, and exercise in coordinated activities.

b. Organizational Tasks During Disaster

A major finding from the previous work is that police departments engage in a variety of tasks during the emergency phases of disasters, but they tend to limit their task performance to those activities that are consistent with their normal, everyday organizational activities. Because of this limitation, task accomplishment is facilitated, but some problems nevertheless do emerge.

Previous DRC work has identified four primary tasks of police organizations in disasters: (1) traffic and crowd control, (2) protection of life and property, (3) search and rescue and (4) warning and evacuation. A more recent independent analysis by Wittenberg and Parham found that these tasks, as well as the communication function, have been maintained over the years.

Interviews identified the emergency public safety function as: on-scene control of law enforcement oriented disasters, maintenance of law and order, traffic control, controlling and limiting access to the disaster area, property protection, security, warning and evacuation, search, rescue, communications, damage assessment and liaison with other law enforcement agencies (1984:21).

Caplow and his colleagues say almost the same thing about police responses in community mass emergencies, namely that:

Police are trained to render first aid, to route traffic away from trouble, to summon rescue and medical personnel and to maintain order at the

scene. They are generally given the task of conducting an evacuation and protecting evacuated areas from looting and vandalism (1984:119).

In addition, earlier DRC work found that the police will sometime temporarily engage in additional emergency related tasks that are not being handled by other local organizations (see Quarantelli, 1983). However, they tend to withdraw from involvement in these other activities when alternative, local organizations are able to undertake these tasks.

Police departments in responding to disasters almost always take a Type I organizational form. According to a long used DRC typology (Quarantelli, 1966), organized responses in major disasters can be differentiated according to whether a new or old structure and a new or old function is manifested. Type I organizations--designated as established ones--use preimpact or old structures to carry out usual or preimpact tasks of functions. Type II or expanding organizations employ regular or preimpact structures to undertake new or nonregular tasks (e.g., a construction company which helps in debris clearance). Type III or extending organizations use nonregular or new structures to carry out preimpact or old functions (e.g., a Red Cross chapter with a greatly increased volunteer work force helping displaced victims find shelter). Type IV or emergent groups develop new structures to undertake new tasks (e.g. an ad hoc group that does damage assessment). Police organizations in disaster periods tend to be established organizations in that they generally utilize their normal, traditional structures in carrying out usual or traditional tasks. Therefore, they have fewer operational problems than many

local community organizations which greatly alter their traditional structure and/or engage in new tasks.

Nevertheless, there are a number of problems that have been identified by DRC in previous work as being associated with the performance of these four major tasks. Some of these problems identified with task accomplishment follow.

1. Traffic and Crowd Control

The local police give considerable attention to controlling the convergence of traffic around the disaster site. To handle the problem, police departments often institute access controls on the disaster site by sectoring or cordoning the area. The major problematic element of this process involves determining the legitimacy of those who wish to enter the disaster site. The establishment of a pass system is the usual attempt to solve this problem.

However, this attempted solution is not "problem-free." Other law enforcement groups such as sheriff's departments and the state police will often issue their own passes. Accepting a pass from any other group gives the organization legitimacy for their involvement. But police on road blocks will often not recognize passes from officials and groups that are unfamiliar to them. Interorganizational conflict and a less effective response are likely to result.

In addition, with regard to the problems of interorganizational conflict and confusion engendered in a pass system, earlier work by DRC reported that the establishment of cordons and road blocks actually may contribute to the problems of congestion in the filter

area surrounding the spot of impact and was based upon certain incorrect, or mythical, beliefs about human behavior in disaster, i.e., that anti social, criminal, and exploitative behavior is common (Kennedy, Brooks and Vargo, 1969).

2. Protection of Life and Property

Enforcement of law, protection of property, and control of anti social elements are normal activities for police departments. During a disaster there is the expectation both within and outside the department that these tasks will be undertaken. Also, it is understood that only law enforcement agencies have the mandate to undertake this activity.

Although this task represents a classic case of an established organization undertaking its normal activities during a disaster, there are some problematic aspects to it. For example, police often exert considerable effort and personnel to preventing looting. But the disaster research literature is clear that looting is not a major problem in the typical disaster, although there is a strong popular belief that it is a common phenomenon (Dynes and Quarantelli, 1968; Wenger, 1975). As noted in earlier DRC work:

. . . the belief that looting will be widespread has important consequences for the police. This belief leads to the commitment of police personnel to "prevent" such behavior. Again, such personnel might be more effectively utilized in realistic disaster tasks, such as traffic and crowd control. It is true, however, if the police did not take such security measures, they would be severely criticized by other community officials who also have similar expectations concerning what "should happen" (Kennedy, Brooks and Vargo, 1969:28).

However, it creates the paradox that there is:

. . . a major deployment of police in disasters related to almost nonexistent problems while other realistic tasks may not be attended to because of the lack of manpower (Kennedy, Brooks and Vargo, 1969:359).

Symbolic displays of force by the local police, often in connection with the National Guard or State Police, have been suggested as an effective solution to this dilemma.

3. Search and Rescue Activities

Search and rescue activities present a number of problems for both the community and the police department (as will be discussed later, we conceptualize search and rescue as primarily the finding, extricating and/or transporting of victims including the dead as well as the injured and noninjured; it does not involve as a major task the providing of emergency medical services; see Drabek et al., 1981; Quarantelli, 1983b). Within the community, the search and rescue task is typically not well organized for a number of reasons, including often because of the sheer magnitude of the event. Everyday equipment and relatively untrained personnel may be adequate for handling small scale, periodic emergencies, but the task can become overwhelming if there are a large number of casualties or the area to be searched is very extensive. In addition, not only does the task occur immediately after impact with the inherent stress of timeliness, but seldom does any one specific community group assume responsibility for the activity. Unless there has been significant predisaster planning for organized search and rescue involving a variety of local groups, even

the more formal response will often be emergent, ad hoc in nature, and often relatively inefficient (see Drabek, et al., 1981).

Police often become involved in search and rescue activities, and previous DRC work indicates that the task often generates a number of problems. Frequently this activity is initially undertaken by individual officers working on their own, and it is often difficult to disengage these officers from their search and rescue activities in order to reallocate them to other pressing tasks. Furthermore, search and rescue activity create problems of communication and control of personnel for the police department. The officers engaged in search and rescue are sometime widely dispersed and often outside of normal communication channels and control. In general, the police become involved in these tasks because they are on the scene when the activities need to be accomplished, and have some pertinent knowledge of the ecology of the disaster area.

Often too, police search and rescue activity is coterminous with the emergent, citizen efforts (Of course it is necessary to remember that studies have consistently shown that the bulk of the early search and rescue is not undertaken by formal groups, but by surviving individuals and small informal groups near impacted sites). At best, the coordination between the "official" search and rescue and the emergent, citizen activities is informal; at worst it leads to duplication of efforts and the missing of areas which should be searched. When skilled search and rescue personnel from other agencies arrive at the scene, the police often usually attempt to withdraw from this task and reallocate their personnel to more

traditional police activities. This reallocation, however, can be problematical due to individual commitment by police department members to informal search and rescue efforts and the previously noted difficulties that police departments have in communicating with officers in the field.

4. Warning and Evacuation

Due to their central location within the community and their control of communication facilities, police departments are often one of the first local organizations to learn of an impending disaster. Therefore, they frequently become a critical link in the warning process.

However, police involvement in warning presents some problems. As with any organization involved in disseminating warnings, the police face the problem of making difficult decisions regarding the issuance of warnings in the face of inadequate or conflicting information and variable probabilities. But previous DRC studies have noted an additional difficulty that is unique to police departments:

With these assets the police often come to see their organization as the key agency in disaster response. While this image is. . . partly correct, this "centrality" sometimes results in a reluctance to keep other community agencies informed since the role they play in a community emergency is secondary. But, particularly in the warning process, failure to pass on information can effect the operations of almost every organization (Kennedy, Brooks and Vargo, 1969:30).

Evacuation activities also presents certain problems for the police. For example, local residents and others may at times be reluctant to leave a threatened area, and the police will be faced with the dilemma of attempting a "forced evacuation." Given legal

barriers in the United States to attempts to forcibly remove persons from their homes, the police often take relatively passive actions, i.e., they disseminate the evacuation advisory, urge people to leave and attempt to aid the process through traffic control, but do not physically remove individuals from their residences. However, the decision to order an evacuation and the tasks involved in implementing it are major challenges for the police in many disasters.

In this report we examine in detail these police activities and their associated problems. But our discussion will not be limited to an examination of only these four tasks. We consider all major tasks undertaken in major disasters by police departments and the problems that may be associated with them.

c. Intraorganizational Adaptations During Disaster

In undertaking these disaster tasks, police departments alter their normal activities and structure. With regard to changes in activities and practices, five major alterations have been observed by previous DRC work: assigning priority to demands, reallocating personnel internally, redeploying and recalling field personnel, adding extraorganizational personnel, and reducing and delaying normal tasks. Alterations in structure have been found to occur in three areas: authority structure, decision making processes, and communication channels.

1. Alterations in activities and practices

Police departments attempt to control the demands that are made upon them from their environment. An important part of this process is assigning priorities to demands for their organizational response.

Police departments always exercise a degree of selectivity in responding to the demands made upon them even during their routine operations. . . The police, then, (perhaps more than any other organization) are accustomed to placing priorities on the various demands made upon them and allocating their resources accordingly. This pattern is continued during disaster operations, and only those calls which are defined to be serious and pertinent are accepted. In this way, existing resources can be used in the more serious calls (Kennedy, Brooks and Vargo, 1969:33-34).

Although the assignment of priority to demands being made upon the department exists in both normal and disaster periods, during the latter the process may be, and often is, more complex. For example, verification of requests and determining the department's ability to respond to them may be more difficult during disaster due to disruption in communication facilities. Furthermore, the level of organizational stress may be higher because a larger number of demands are made upon the organization and these exceed the department's capabilities to respond (Drabek and Haas, 1969b).

During disaster operations, police departments are often faced with the issue of reallocating personnel internally. Although at least moderate sized police departments have five general divisions, they do not equally participate in disaster activities. Generally, the patrol and traffic divisions are most heavily involved in disaster response, with the former being given overall command.

Other divisions, such as detective, vice, juvenile, maintenance, and administrative services are often not involved in field work, but they do provide a pool of personnel who can be reassigned to emergency field operations. However, earlier DRC work found that they are often underutilized in disaster situations. For example, even though "plain

clothes" officers, such as detectives, often possess pertinent skills and knowledge, they are not often sent into the field. Obviously, the degree to which reallocation of personnel is needed is dependent upon the magnitude of the event and the degree of stress that is placed upon the department.

Related to the issue of personnel reallocation and the degree of organizational stress that is experienced by a department is the issue of the redeploying and recalling of field personnel. With initial notification of the event, or as a result of being first responders, police departments tend to redeploy personnel who are already in the field to disaster tasks; in addition, they will often mobilize off duty personnel with field responsibilities.

But these adaptations often prove to be complex and laden with some inherent difficulties. For example, in a focused disaster, a surplus of personnel may be redeployed in the field and result in an inefficient allocation of unneeded officers at the impact area. In diffuse disasters, the magnitude of the event is often not known, and the parameters for redeployment of organizational personnel are vague. Furthermore, in either case, work schedules are often altered. In addition, redeploying personnel can often be difficult due to the communication problems that can surround a disaster and the inaccessible nature of some officers in the field.

The recall of internal personnel and the redeployment of field officers may not be sufficient for organizational action under the circumstances of a major disaster, one that creates extreme stress upon a police department and makes demands upon that group which

exceed its capabilities for response. In such a setting, the police department may be faced with the issue of adding extraorganizational personnel. Auxiliary police may be called; regular officers from neighboring jurisdictions may arrive to assist the local force. Mutual aid arrangements may be instituted.

However, past DRC studies have shown that police departments are very reluctant to utilize any volunteers to supplement their forces (Kennedy, Brooks and Vargo, 1969). Departmental concern about the legality, training, and loyalty of volunteers often results in a decision not to employ volunteers, even if they may have pertinent disaster skills. Furthermore, while the police may work with volunteers in initial search and rescue activity, the integration and coordination of professional and volunteer actions is often very difficult particularly in the absence of prior planning.

Finally, a typical response on the part of police departments to disaster conditions involves reducing and delaying normal tasks. "During the high demand period of a disaster, which may last several hours or several days, many normal duties of both the line and staff sections of the organization are suspended" (Kennedy, Brooks and Vargo, 1969:36). Normal traffic, detective, patrol and administrative tasks are ignored or delayed. In addition, there appears to be a lessening of the normal demands being made upon the police, i.e., "minor calls" from the public decrease.

In this report we attempt to be sensitive to alterations in these five activities and processes. Do these patterns still prevail? To what extent are they indicators of the degree of organizational stress

or the magnitude of the disaster? What are their influences upon the effectiveness of police response to disastrous events?

2. Alterations in Intraorganizational Structures

With the possible exception, as noted later, of the fire department, the police exhibit fewer structural changes and undergo less organizational stress than many other involved organizations during disaster. However, certain alterations and problems have been observed with regard to the internal structure of police departments in past research. These difficulties appear to be related to three conditions of the altered disaster environment: (1) a condition of great uncertainty, (2) a condition of great urgency, and (3) a loss of organizational autonomy. The third factor is particularly problematic to police departments who normally operate with significant independence within their community.

With regard to the intraorganizational structure of police departments, alterations can be observed to occur in three critical areas: (1) the authority structure, (2) the decision making processes, and (3) communication channels.

The Authority Structure

We previously noted that during normal periods the authority structure of the police department is a quasi-military model. While ultimate authority resides with the highest ranking officers, the field directives of the individual officers come from the dispatcher in the communication center (in many departments there are not even many directives by nominal supervisors at the start of shifts).

Furthermore, the officers operate with significant autonomy while in the field and exercise their discretion.

The disaster situation alters this traditional pattern (Kennedy, Brooks and Vargo, 1969). Within the headquarters, the highest ranking officers assume more authority for actual police operations. Furthermore, a Field Command Post will often be established under a senior officer. The communication center continues to direct police activity, but the mode of operational direction, and the balance and kinds of information and instructions may change substantially. While the traditional authority arrangements are maintained, during the disaster they become actualized in a way they are not during normal times. The department often ends up being "commanded" in one sense by at least three different subentities.

In addition, officers in the field, while still exercising some autonomy as they take on individual disaster tasks, sometime also come under on-the-spot supervision by field commanders and are sometimes given directions or suggestions by non-police emergency officials (e.g., public safety directors, local emergency agency managers) or high ranking city officials (e.g., city mayors or county judges).

This altered authority structure can present problems of conflicting directives, a lack of coordination among the units, and the imposition of a nontraditional source of supervision over the individual officers. Previous DRC work by Kennedy (1970) and Wenger (1973) has identified the nature of the difficulties engendered by this alteration. In this report we also consider alterations in

authority which occur within police departments and the effect of these changes.

(It should be noted that the Incident Command System has been developed as a model command structure to be implemented at the time of disaster. But we shall delay an examination and discussion of that system until we consider fire departments. The model was initially developed to be applicable to fire operations and has had only limited diffusion to police departments at this time.)

The Decision Making Process

The impact of disaster upon the decision making processes of a police department varies with the time phase of the disaster. During the phase of warning and impact the effect is minimal. "Decision-making during this phase remains quite organized and does not deviate too greatly from usual patterns" (Kennedy, Brooks and Vargo, 1969:47). To a considerable extent this pattern results from the limited, rather traditional tasks undertaken by the police during this period.

It is during the initial "mass assault" phase of disasters that most of the problems of an organizational nature develop within police departments. In these first few hours, in addition to their normal activities, the police tend sometime to assume many tasks not being performed by others. The authority structure is often altered and, as a result, decision making becomes haphazard. As noted by DRC in its previous, major study of the police:

Action tends to occur before the need for it has ever been clearly established. Authority patterns break down to a certain extent and decision-making is haphazard and carried out in terms of criteria other than those officially prescribed. Men and officers tend to rush into the field when

often their presence would be more valuable elsewhere. Those called in from off-duty may never report for assignment as they become involved in tasks before ever arriving at headquarters (Kennedy, Brooks and Vargo, 1969:49).

The reorganization phase is highlighted by the assignment of formal duties, the alteration of work shift patterns, the formation of work crews, and a withdrawal from nontraditional tasks. "Toward the end of this period many patrols are back on normal duty and the structure of authority resembles much more closely that of normal times. . . Decision-making, as a result, becomes much more rational in that information is more readily available" (Kennedy, Brooks and Vargo, 1969:49). During the "clean-up" phase, decision making returns to normal.

Communication Channels

The communication center is the core of normal operation for the great majority of police departments. During disaster its importance is typically magnified. The volume of communication traffic increases drastically and a greater variety of communication devices are used. Such changes can, and do, create problems.

While calls for minor complaints and normal duties generally decrease during the emergency period of a disaster, the sheer volume of communication messages increases dramatically. Reports of damage, requests for personnel and material, and instructions for deployment flourish. Each of these types of communication, however, has problems associated with it. Reports of damage, while voluminous, are often incomplete and myopic. The deployment of personnel is hindered due to

a lack of accurate knowledge about the scope of impact and the actual needs of the community. As earlier noted by DRC:

A rapid increase in the volume of both line and air traffic is generally experienced with both being used somewhat inefficiently, at least in the early phase of operations. . . In conclusion, communications are crucial and complicated and form an area of disaster operations which must be efficiently handled if the police are to satisfactorily perform in a disaster (Kennedy, Brooks and Vargo, 1969:54).

In this report we examine any alterations that occur in the authority structure, decision making processes, and communication channels in police departments during disasters. In addition, we consider any problems related to these changes and how they influence the operational effectiveness of the police.

d. Interorganizational Relationships

The police department develops more extensive interorganizational relationships during disaster periods than during normal time periods. During usual, everyday operations, police departments tend to act with considerable independence or autonomy. During the emergency period of a disaster, major changes in relationships occur with the local fire departments, city government entities (particularly local emergency management agencies, i.e., LEMAs), other law enforcement groups and the utilities. While many of the relationships are mutually beneficial, we found that the police are very reluctant to give direct or indirect control of their forces to outside units. In addition, while relationships with organizations that normally interact with the police may be positive, conflict and disagreement are likely to result

when the police must interact with groups, local or otherwise, with which they are unfamiliar.

While the relationships that the police have with other organizations during disaster are more numerous than their normal, day-to-day autonomous method of operation, they seem nevertheless to have less interaction with other local units than do most other groups. Increased interaction with fire, city government agencies, the Red Cross and other relief groups, law enforcement agencies outside of the community, and public utilities occurs. However, most of these contacts are requests for information or some form of aid. The major problematic element of these relationships involves the police department's attempt to maintain independence from control by other organizations, to protect their domain, and at the same time, to establish a central role in the overall community response.

The relationships between police organizations and other disaster relevant groups can be rather mixed. While relationships between police and fire departments can be positive and coordinative, they are also often uneasy and conflictive, as was also found in the DRC research on chemical disasters (Quarantelli, 1984b). However, on the surface there is usually an attempt to present an image of cooperating police and fire organizations.

The relationships of the police to other city government agencies is frequently more varied and problematic. For instance, while interaction of officers in the field with employees from street maintenance, engineering and public works departments may be positive,

higher level contacts with LEMAs may be problematical. The earlier DRC studies, particularly found that police were often reluctant to work with what, at that time, were called offices of Civil Defense. Impressions from later research suggests that police still frequently have mixed views, at best, of LEMAs. Certainly police organizations are very protective of controlling the operation of their departments. In the past DRC work, it was found that while the police usually sent liaison personnel to the Emergency Operations Center (EOC), they were likely not to participate, or to withdraw from any arrangement that seemed to them to usurp their control over their operations. Conversely, the police, due to their initial and wide scale involvement in the response effort, often informally attempt to take on a coordinating role for themselves in the local response.

When the involved organizations are external to the local municipality, the interorganizational relations can become rather complex. This complexity can be seen in relationships with law enforcement agencies from outside the local community, such as in some cases the Sheriff's office (which many residents often do not see as a city or town organization), and in almost all cases, state police and National Guard units. While the norm of local autonomy tends to prevail, conflict over command and authority can result when the local group is not perceived by outside organizations as being an effective force.

In this report we examine the interorganizational relationships of police departments in disasters. The problems and patterns of

cooperation, exchange, competition and conflict are analyzed and are discussed.

The previous pages have presented a brief overview of the previous work done on police organizations in disasters. In particular, we focused upon the: 1) predisaster structure, resources, and disaster planning, 2) organizational tasks during disaster, 3) intraorganizational adaptations during disaster, and 4) interorganizational relationships. These concepts and previous findings provide the core elements for our analysis of police departments. In the case studies that will be presented, special attention is paid to these dimensions, and an attempt is made to determine if these previously found response patterns still manifest themselves in the disasters we recently studied. We also are interested in seeing if there have been any changes in the last two decades in the predisaster organizational stance of police groups that may be affecting their current day disaster responses (e.g., one recent survey reported that 21 percent of all local departments participate in some ways in the provision of emergency medical services; see Beyond Law Enforcement, 1989).

At this time we turn to a discussion of the existing knowledge concerning fire department operations during disaster.

Chapter 3. FIRE DEPARTMENTS

Previous Studies

Fire departments are rather visible organizations in most communities. This visibility as well as their involvement in everyday fire emergencies, and their material resources all contribute to community expectations that fire organizations will play a key role in disaster response, which they often do. Although not as centrally involved as the police in all types of natural disasters, fire departments play critical roles, not only in fire emergencies, but, increasingly, in toxic and hazardous materials incidents and other types of technological crises (they also frequently have an important role in the delivery of emergency medical services on an everyday basis).

However, the social scientific research literature on fire department activity in disasters is remarkably sparse. Studies that focus upon social organizational analyses are especially few in number. For example, the DRC annotated bibliography (Linn et al., 1988) was able to identify only eight studies that specifically dealt with fire department response to disasters. But even this meager data base is somewhat misleading. For example, three of the eight studies were conducted outside of the United States (Hazen, 1979; Britton, 1983; and Innes and Clark, 1985). Although the works of Britton and Hazen present numerous insights into organizational response patterns, the transferability of this information to the American scene is rather limited. In addition, other studies focus more upon the issue of psychological stress upon firefighters, such as the previously

noted works by Innes and Clark (1985) and by Killian (1952). Of the remaining four studies, the work by Best (1978) reports upon the behavior of the participants in the Beverly Hills night club fire. While it is a rather detailed case study of one fire, it does not provide great insight into the organizational response problems of the fire departments involved. Stambaugh (1987) recently examined the evacuation of a community during a fire at a hazardous chemical plant. Her discussion focuses upon the role of the fire department in fire suppression and evacuation activities. Finally, two DRC publications have focused purely on fire departments in natural disasters. A Working Paper by Blanshan and Hershiser (1973) examined the intraorganizational and interorganizational problems associated with suppression of the major conflagration in Chelsea, Massachusetts. The major compilation of DRC work on fire departments in disaster, however, was summarized by Warheit (1970a, 1970b). The two publications considered such factors as the predisaster structure of fire departments, their disaster tasks, and the intraorganizational and interorganizational problems faced by these community groups.

In addition to this meager body of knowledge, there is also some social scientific literature regarding the organizational analysis of fire departments during riots or civil disturbances. This literature has been developed by the DRC. It includes a detailed case study of the Los Angeles Fire Department during the Watts Riot (Warheit and Quarantelli, 1969), and various discussions of organizational and task alterations that occur within local fire departments during these types of conflict based crises (Warheit and Waxman, 1973; Waxman,

1973; and Weller, 1973; also the previously noted Warheit publications deal with the planning and operation of fire departments both in disaster and riot situations).

Finally, observations relevant to fire department operations in disasters have appeared in DRC studies of specific events or topics. For example, a DRC Working Paper by Ireland (1983) notes the undertaking of various nontraditional tasks by the fire department during a flood in Salt Lake City. Adams (1965) focuses upon the problems of interorganizational relationships between police and fire departments during an apartment fire and explosion. Quarantelli (1983b) notes the nature of emergent tasks that established organizations, such as fire departments may assume under certain disaster conditions. Kennedy (1967) and Yutzy (1964) provided some very early field impressions of fire operations in disasters.

This overview of previous studies indicates that DRC has been the major source of information of a social scientific nature on fire department response. As can be seen in the above citations, particular attention has been paid to fire departments in the studies of emergency organizations done for the Office of Civil Defense (OCD) in the late 1960s and early 1970s, and in the research undertaken in the late 1970s under an NSF grant on the community level preparations for and response to chemical disasters and emergencies. The bulk of the behavioral science research in the fire area, such as that supported by the U.S. National Bureau of Standards, either deals with the behavior of people in fire situations (as was, and is, being studied at the University of Maryland), or with the individual psychological

reaction of fire officers in a high stress occupation. Thus, the previously mentioned DRC studies provide the only organizational level empirical data available on which to build our analysis.

However, even this literature presents some problems for the current study. Unlike the research on local emergency management agencies, police departments and hospitals in disasters, all of which is summarized in major publications, there is no major public DRC summary report on fire organizations. The observations and findings assembled through the years have never been pulled together in a summary volume. Also, as noted, much of the DRC published material is on the planning and operation of fire departments in riots, rather than natural or technological disaster situations. While the two types of crises are both collective stress situations in Barton's (1970) term, there are, as DRC has frequently noted, major differences in organizational behavior in consensus and conflict types of community emergencies.

However, given what exists, the following discussion is necessarily based upon the previously noted sources. The published articles and case studies, uncirculated Working Papers, and an unpublished DRC partial manuscript provide the core of the discussion. Our discussion will follow the basic outline utilized for the police department.

The Nature and Problems of Fire Departments

Our discussion of fire organization activity during disasters focuses upon five topics. First, we consider the predisaster structure, resources and disaster planning of departments. Second, we

depict the tasks that are undertaken by these departments during the emergency period of disasters. Third, we examine intraorganizational alterations and problems associated with the accomplishment of these tasks. Fourth, interorganizational relationships and problems are considered. Finally, specific attention is paid to the Incident Command System that has been developed to guide fire operations during disaster conditions.

This discussion summarizes the baseline knowledge of the past. We present the previous DRC findings in these areas; our current research is partly aimed at determining if these earlier findings still are valid at the present time.

a. Predisaster Structure, Resources and Disaster Planning

With regard to the issue of normal fire department structure, resources, and disaster planning, the following observations from the previous literature can be presented. Structurally, fire departments vary considerably, but functionally are rather similar in at least having as a central task the suppression of fire. Furthermore, fire organizations have standard operating plans and extensive experience in handling regular fire emergencies. However, fire departments in the United States in recent decades have done little planning for, and have very little experience in very large fires and other major disasters (compared to everyday fire emergencies).

From an organizational point of view, the more than 31,000 fire departments in the United States vary tremendously in their size, composition and other structural dimensions. One of the major sources of diversity concerns the relative mixture of paid and volunteer

personnel. Fire organizations of only paid members constitute a minority of all firefighting groups in the United States; conversely, those with volunteer staffs are an overwhelming majority of all fire organizations (only 1,841 departments of the 31,224 have full time professional personnel; see Directory, 1982: 322). In most states, the predominant pattern is for a few large full time professional organizations, coupled with a very large number of volunteer groups, and a small number of mixed departments. One consequence is that a great majority of communities are covered generally by part time personnel and mostly nonprofessional groups (in 1982 it was reported that there were 860,224 volunteers among the approximately one million fire fighters in the United States; see Directory, 1982:322).

We should note that in a strict sense the distinction between volunteers and professional can not always be made in terms of paid versus non paid. Some volunteers do get paid. Also, some long serving volunteers are very well trained and are equivalent to some full time professionals. But for purposes of exposition, we will use the term "volunteer" and "professional" in this report recognizing that the qualifications we have just noted may be present in some situations (see also, Perkins, 1987).

However, there is also a huge diversity within the volunteer fire departments. While some have barely enough line workers to operate, others have thousands of members, although many of them may be more nominal than operative personnel. Budgets, equipment, training and facilities run from sparse to lavish. Many have responsibilities only

for villages and rural areas, but some cover very heavily populated suburban localities.

Therefore, the social organization and structures of fire departments run from the very simple to the very complex. Large metropolitan fire departments not only have more personnel (numbering in the thousands), but also specialized companies (e.g., engine, ladder, rescue, etc.). Also, they tend to have special staffs for training, fire prevention, planning, communications, purchasing, arson investigation, community relations and other purposes. The most prevalent pattern for these large groups is the traditional bureaucratic, military model of organization with clearly defined staff and line positions. A pyramidal authority structure is often multilayered, with such positions as Chief, Chief Deputy, Deputy Chief, Battalion Chief, Major, Captain, Lieutenant, and various levels of noncommanding fire fighters. Large departments are further functionally divided into divisions, stations and companies. In contrast, some volunteer fire organizations are, sociologically, not much more than informal small groups. Most volunteer groups are quite autonomous, but many fire organizations in large cities are often subunits, along with the police, in larger departments of public safety, and they vary in the extent to which they are under the direct control of the mayor, city manager, city council, and/or civil service bureaucracy of the community. In effect, there is no one standard fire department structure in the United States.

Nevertheless, whatever the heterogeneity in structure, all fire departments have one common function or task, i.e., the quick

suppression of fires. This task probably accounts for the fact that almost all departments have their own radio communication channels, and in many cases, their own communication systems (although this is slowly changing as police and fire communication activities are coming under a common and integrated communication system). Other fire related functions, however, tend to be carried out only by the larger, departments with full time personnel. These tasks include fire prevention activities (ranging from approving construction and remodeling plans to building and equipment inspections) and fire safety education. A number of the larger departments also have paramedical services which often are provided to the community outside of fire situations in such events as auto accidents, drownings, home and industrial accidents, heart attacks and seizures, and a host of other non-fire emergency related tasks. (The magnitude of involvement by fire departments in medical aid responses is indicated by the fact that these totaled about five and a quarter million runs in 1982: see Carwile, 1983.)

Earlier DRC observations indicated that the vast majority of fire departments have standard operating procedures (SOPs). However, few have emergency operations plans. (There were a few developments along this line for civil disturbance and riot situations in the late 1960s and early 1970s which involved the use of convoy or task force operations, changes in communication and decision making procedures, and so on; see Kreps, 1973a, 1973b; Kreps and Dynes, 1973.)

Relatively little else of formal emergency planning were evident in the earlier DRC studies. Nevertheless, attention to training for

and responding to everyday fire emergencies is likely encouraged by the standards advanced by the American Insurance Association which in turn helps set the fire insurance rates paid in different localities. The advancement of standards and the noting of special problem areas by different professional fire associations, state fire marshall offices, the National Fire Academy, and, recently, certain activities of FEMA and the chemical industry have all presumably encouraged more and better planning processes. Furthermore, in larger departments, planning, as an explicit process, is often the responsibility of some separate office in the administrative bureaucratic structure.

While the prevalence of formal emergency plans and planning was not a major characteristic of fire organizations 10 or 15 years ago, it is probable that a movement in that direction started at about that time. As a recent non-DRC statement reported.

Fire departments usually do not have an emergency operations plan. They are run primarily through Standing Operations Procedures and "reactionary responses." The latter is disappearing as a policy. This is due to the new awareness and need to be prepared for all disasters, and possible liability for hazardous materials incidents, mass casualties caused from earthquake, fire in high rise buildings, terrorism, etc. (Wittenberg and Parham, 1984:20).

In addition to having an SOP, it would be the very rare fire department in the United States which, during the course of a year, would not have some experience with a fire. Those organizations in middle size and larger communities tend to have daily experiences with actual fires and runs to potential fire scenes. Thus, unlike LEMAs, which may not experience an actual disaster or a threat during a whole year, fire departments do actually fight fires--it is a reality of

their world with around three million fires annually, not to mention more than 850,000 runs on false alarms (for statistics, see Carwile, 1983:132). This routine experience with emergency could be expected to aid fire response to disaster.

However, it is also clear that the greatest number of fire departments have procedures for and respond to relatively minor or insignificant fires, at least from a community point of view (whatever personal stress they may create for the fire fighters or victims). The approximately half million transportation fires which are responded to yearly, for example, mostly involve single car fires, many of a minor nature. There are usually less than 300 multi-death fires in the United States every year (Carwile, 1983: 138). The bulk of the experiences of the average fire department is with relatively routine minor fire emergencies.

The kind of conflagrations which used to sweep American cities in past centuries (such as the massive fires which burned hundreds of buildings in New Orleans in 1788, New York in 1835, Philadelphia in 1850, Boston in 1872, Hoboken in 1900, etc.; for details and other examples see, Nash 1976) no longer occur. Nonetheless, major fire disasters still do occur. For example, in Chelsea, Massachusetts, a fire in October, 1973 was studied by DRC; it destroyed 18 city blocks, damaged 12 others and left property damage figures in the millions (Blanshan and Hershiser, 1973). More recently, there have been major building fires, such as the MGM hotel fire in Las Vegas, Nevada, or the Beverly Hills, Kentucky, nightclub fire (Best, 1978) which went considerably beyond everyday fire emergencies. There have also been

serious fire threats in connection with different kinds of chemical disasters as well as conflict situations (e.g., the MOVE incident in Philadelphia and the ghetto area fires in the late 1960s in American cities which were studied by DRC, see Quarantelli and Dynes, 1974)

Thus, fire departments can be faced with major fire disasters.

Also, fire groups can get involved in major non-fire disasters. After the Xenia, Ohio tornado, for example, the local and nearby fire organizations from the Dayton area undertook the first systematic search and rescue effort in the stricken area (Taylor, Ross and Quarantelli, 1976). In hurricanes and floods, the local fire department often is involved in evacuation efforts.

Nonetheless, except in certain disaster prone localities the probability of a fire department being directly involved in a major non-fire disaster is relatively low. Many fire organizations have not had such an experience in the collective memory of their members. Even when affected by a non-fire disaster, the experience is often of an indirect nature, as was the case in Wilkes Barre, Pennsylvania, where DRC found that the local fire department was flooded out from its physical location. Thus, relatively few fire departments have had experiences of major fire and/or other disasters.

Given this condition, it is not surprising that early studies found little disaster planning on the part of fire departments, especially for non-fire disasters. Somewhat of an exception to this observation is a frequent link and some planning between the local fire department and chemical companies and complexes in and around the local community (although as the DRC chemical disaster studies found,

the relationship was often more nominal than real and frequently did not contribute to overall community or integrated disaster planning; see Quarantelli, 1984b). Caplow and his colleagues likewise have noted that "most of the larger departments have a Hazardous Materials Team (Hazmat Team) which has been trained to recognize and deal with hazardous materials" (1984:119).

In the past, DRC in its work has found that fire departments, as a whole, have few regular links and contacts with most LEMAs (Wenger, Quarantelli and Dynes, 1987). Furthermore, they also often have uneasy, if not conflictive, relationships with police departments (the publicized current situation in New York City is simply a dramatic manifestation of what is less overt in many other communities, although in some areas there are extremely close and cooperative ties). Overall, the general picture earlier studies convey is that usually fire departments are not central actors or active participants in overall community disaster planning. As an earlier DRC Working Paper noted, "Fire organizations are probably more independent of other groups than most community emergency agencies" (Warheit, 1970b:10).

In this report we try to determine if this pattern of little disaster planning is still prevalent. In particular, the degree of planning for non-fire disasters is examined. To what degree have departments gone beyond simple SOPs in their planning activities? What factors are important in their planning efforts? To what extent are these observations on predisaster structure and planning still viable after 10 to 15 years?

b. Organizational Tasks During Disaster

Among the various groups within a community, the fire department, because of its control of various equipment and personnel, would seem to be a likely candidate to undertake a number of different tasks during the emergency period of disasters. However, previous DRC research literature indicate that fire departments are reluctant to undertake tasks that are not part of their normal, routine day-to-day activities or appear to be outside of their organizational domain or expertise. Of course, all fire departments consider fire suppression to be a major, legitimate task. In addition, search and rescue activity may be undertaken by some local departments, particularly those with trained "rescue teams" and equipment. Finally, those departments with EMT or paramedic units may become involved in emergency medical treatment and transportation of victims. But when fire departments become involved in other tasks they tend to retreat to their traditional activities as soon as possible.

An earlier DRC report noted that:

Disasters which do not involve long-term search and rescue or fire problems are largely peripheral to the skills and resources possessed by fire departments. Consequently, their response is usually confined to the immediate post-impact period when the psychological climate in a community necessitates the response of all the community's emergency organizations. During this period, fire personnel are likely to become involved not only in search and rescue, but also in traffic control, the restoration of vital communication services, the transporting of injured to hospitals, and the provision of boats, trucks, pumps, personnel and other resources.

As quickly as the disaster situation subsides and the immediate crisis has passed, fire departments begin to withdraw from active participation in those

tasks not directly related to their daily operation. The speed of this withdrawal is related to the nature of the demands and the availability of other organizational resources. Efforts on the part of other organizations or officials to engage fire departments in long-term activities not related to their primary responsibilities are almost universally resisted entirely.

Major community emergencies which involve fire or the threat of fire, such as an explosion or a civil disturbance, place extensive and unqualified demands on fire organizations. They alone possess the community's mandate to deal with fire problems; they alone possess the skilled personnel and equipment to cope successfully with the emergency. Their organizational response is, therefore, immediate, total, and continuous throughout the crisis period (Warheit, 1970a:364).

In carrying out these traditional tasks of fire suppression, search and rescue, and to a lesser extent, the delivery of emergency medical service (EMS), the fire department faces many of the problems associated with any disaster activity, i.e., an altered environment, unknown parameters of the event, stress induced by demands for immediacy of response, inadequate information, and problems of coordinating activity with other organizations.

In many respects, fire suppression presents the fewest problems. It is a traditional task undertaken by a fire department with few competitors. The department is often able to control its own operation. Although problems of coordinating mutual aid with other companies may exist, this task is the one that departments are best prepared to handle. But in the case of search and rescue, fire departments face the problems inherent in this activity that must be faced by all organizations, including the critical issue of coordination of the formal organizational activities with the emergent,

citizen efforts. The provision of EMS services is particularly troublesome for those departments without trained EMT or paramedic units.

Expansion of fire department tasks beyond these traditional, basic activities does occur, but the previous literature has found that it is a rare happening. Ireland (1983), in a DRC Working Paper, in a study of a flood in Salt Lake City, found that the fire department engaged in such non traditional tasks as information collection for the entire city government, the coordination of sandbagging efforts, and clean up coordination. These findings were utilized by Quarantelli (1983b) to propose an expanded typology of emergent activity in disasters. Nevertheless, the bulk of the DRC observations indicate that not only do fire departments tend to limit their task involvement in disasters, but they are also one of the first community units to withdraw from disaster activities and return to their normal, readiness status.

. . . As noted above, fire officials generally resist long-term involvement in nonfire-related disasters in order to keep their organizations intact, and hence, ready to meet those demands associated with their normal functioning. Problems related to the demands for continuing participation, once the initial crisis is passed, are usually resisted successfully and rarely disrupt the structure of fire departments (Warheit, 1970:365).

In this report we attempt to determine if these previous observations still apply to fire department activity. Do fire departments take on additional tasks? What is the nature of these tasks? Has the extension of fire department activities increasingly into the EMS area also extended their involvement in other disaster

activities? What kinds of problems may be associated with the performance of both traditional and nontraditional tasks?

c. Intraorganizational Adaptations During Disaster

A major theme from the previous literature is that, in general, fire departments, despite their usual lack of disaster planning, do not have too many intraorganizational problems in community disasters in which they become involved. This observation is valid, even though certain intraorganizational coping or adjustive behaviors can sometime be observed.

An earlier DRC report found that major alterations or modifications in the internal structure and behavior of fire departments definitely occurred during large scale mass emergencies and sometime large scale natural disaster situations. Thus,

When community emergencies involve fire of great magnitude and/or duration, fire departments must alter a large number of their routine organizational procedures. Reserve apparatus are activated, off-duty personnel are recalled, on-duty hours are lengthened, logistical problems related to the relief and feeding of firemen arise, supplies have to be replenished, emergency repairs become necessary, communications facilities become overloaded, emergency priorities have to be established, and, in most instances, the decision-making process is abbreviated or otherwise altered. As a result of these adjustments, some of the subunits within the department may cease functioning, while others operate more or less on an ad hoc basis. In short, the internal structures of the department undergo change as it attempts to deal with the extensive demands and problems which arise as a result of them (Warheit, 1970a:365).

Although this previous research noted these many alterations, it, nonetheless concluded that:

The problems encountered by a fire department during periods of community crisis depend, to a large

extent, on the same factors which determine its overall disaster response: the nature, magnitude, and duration of the emergency; the personnel and material resources possessed by the participating department; and the availability of other resources. Emergencies which place but a few short-term demands (especially when these demands are not related directly to the principal tasks of fire departments) produce few problems (Warheit, 1970a: 367).

Therefore, changes in such structures as decision making patterns, communication channels, organizational work schedules, and logistics have been observed to occur. Nevertheless, these alterations do not create intraorganizational problems of the severity and magnitude for fire departments as they do for other local emergency organizations. The obvious question is why?

There could be a number of reasons for the relatively few intraorganizational problems for fire departments in disasters. First, the shift arrangements of large departments and the large number of volunteers often available to smaller ones, usually mean that there is not a shortage of personnel. Second, members of fire organizations, unlike police department personnel, almost always work in teams or groups of known others who usually have trained and worked together previously. The difficulties that police may experience in collective action, multiple commands, and working with unknown others are less extreme for fire departments. Third, usually in fire suppression activities the local operative unit works under the direct supervision of departmental officers. The domain and boundaries of the organization are maintained. Fourth, as noted previously, the central task of fire suppression in most cases is clear (although, as the DRC studies of chemical disasters have shown, when fire personnel

are first responders in hazardous chemical incidents, the situation is both perceptually and behaviorally less clear, see Quarantelli, 1984b). SOPs, at least up to a point, cover mobilization of personnel and resources, authority lines, channels of communication and traditional fire fighting tactics.

Thus, in the great majority of cases there are almost no intra-organizational problems, but as the DRC studies of fire departments in civil disturbance and riots showed, there can be a point where the demands on the system can become overwhelming (see previous references). Also, given the considerable variation of training, especially among volunteer groups, what should be done and what actually is done do not always correspond, so there can be intraorganizational problems of communication, coordination, decision making and mobilization of resources. (Also, as we shall indicate in the next section, intraorganizational problems may accompany interorganizational problems; this is often the case in major disasters.)

However, the majority of intraorganizational problems appear to be primarily related to logistic and technical matters, such as low water pressure, the absence of appropriate masks and equipment, the burning of hoses, and the lack of specialized tools such as lights and heavy equipment for rescue operations. Given the nature of most of these matters, any shortage, absence or poor quality of the elements involved presents problems because their easy or quick substitution is often not possible. As such, intraorganizational difficulties in response can occur.

In this report we attempt to see if these earlier impressions of relatively few intraorganizational problems still exists at the present time.

d. Interorganizational Adaptations During Disaster

Although there may be relatively few intraorganizational difficulties for fire departments in responding to disasters, there often appear to be many interorganizational problems. Some of these involve jurisdictional issues. However they can take a variety of forms. For example, an earlier DRC report stated:

The most prevalent problems confronting fire organizations during emergencies created by tornadoes, earthquakes, and other so-called "natural disasters" is that of maintaining their organizational boundaries against the expectations and/or demands of community officials and other emergency organizations (Warheit, 1970a: 365).

The DRC studies of chemical disasters confirmed this observation (Quarantelli, 1984b).

In addition, as the earlier report of Warheit also noted, "fire departments do not function within a social vacuum, but rather within the context of other organizations." In everyday operations, all emergency type organizations possess both a domain and the resources needed to fulfill the goals implicit in that domain, and are able "to operate semi-autonomously." But with a disaster, the emergency organizations of the community "are compelled to make a collective effort to meet the greatly intensified demands, their efforts being marked by an increased intra-dependence and by the need for a more conscious coordination of tasks." The necessity of coordinating fire departmental activities with those of other organizations also poses

difficulties. Interorganizational "liaison and communication nets must be established; consensus regarding mutual priorities must be allocated/exchanged; boundary problems must be handled. These difficulties are usually emergent in nature; hence, there are few existing structures to facilitate the crucial interorganizational adaptations being made. As a consequence, the effectiveness of fire departments. . . is frequently diminished" (Warheit, 1970a: 365-366).

Even when there has been some prior planning and even with other fire departments, interorganizational problems can surface. For example,

When fire officials realize they cannot successfully cope with all of the demands being made on them, they activate, where possible, mutual aid pacts with other fire departments. These additional resources, while extremely helpful, do create a number of logistical problems. One of the most common results from the fact that each department has its own assigned radio frequencies. As such, its transmitting and receiving equipment is not compatible with that being used by other departments. This makes communication between host and supporting departments extremely difficult and sometimes impossible. A second problem generated by the presence of a large number of departments operating in one community occurs from the lack of standardized fittings, hoses, hydrants, and other hardware. (The benefits of having additional fire departments working in an area are sharply reduced unless a large number of adapting devices are immediately available.) (Warheit, 1970a: 366).

Furthermore, it appears that the greater the scope of the disaster, the more likely there will be interorganizational problems for fire departments. In part, this is because many such situations cut across jurisdictional boundaries, often many of them. A result, often seen in plane crashes and in diffuse hazardous chemical

accidents, is that multiple fire groups from multiple jurisdictions are attempting to work together in a "foreign" jurisdiction.

In addition, the larger the disaster, the more probable fire departments, faced with more legitimate demands than they can handle, will be forced to develop a priority system by which they allocate resources. A DRC report observed that, "this system of priorities arranges, in hierarchial order, the kinds of fire and other emergency situations which will receive a primary response, those which will receive a secondary response, and those which will receive no response at all" (Warheit, 1970a: 366-367). In chemical disasters, the DRC research indicates there may even be a question of whether fire suppression will be attempted at all in the situation (Quarantelli, 1984b).

The increased participation of fire department officers in making decisions pertinent to the community's collective disaster response may create an additional problem. "The somewhat new and enlarged role places fire authorities in positions of increased power and, as a consequence, in a position conducive to conflict with other officials" (Warheit, 1970a: 367). The DRC work suggests that this may be an increasing problem in instances of chemical disasters (Quarantelli, 1984a).

In this report we examine the nature of the interorganizational relationships that are developed by fire departments during the emergency period of disasters. Not only do we consider the problematical nature of these relationships that was highlighted by previous

work, but we also consider how these relationships may both aid and hinder task accomplishment for fire units.

e. The Incident Command System

Since the earlier work by DRC, one of the major developments in the fire service area has been the formulation and diffusion of the Incident Command System. The system was first developed during the 1970s by departments in southern California to handle the problems of broadscoped, multi-jurisdictional brush and forest fires. Seven fire agencies formed a group known as the FIREScope (Fire Resources of Southern California Organized for Potential Emergencies) TASK FORCE. The task force developed an elaborate, complex, command-and-control model for fire organization at any incident. It was designed to handle some of the intraorganizational and interorganizational problems of coordination, task allocation, communication and decision making that have been observed in numerous large fire settings. Since its inception, the model has become disseminated and adopted by many fire departments across the country. (Its recency is indicated by the fact that it is not mentioned at all in a FEMA-supported report on Disaster Planning Guidelines for Fire Chiefs; see Hildebrand, 1980.)

However, from its inception, it has been modified. For example, the National Fire Academy has developed the Model Incident Command System, which is a compilation of the existent knowledge in the area (Phelps and McDonald, 1984). Other versions have been incorporated by NIIMS (National Interagency Incident Management System, see Cowardin, 1985a). The term has become a "buzz word" within fire fighting services and many departments throughout the country claim to

utilize it. (For a discussion of the Incident Command System, see Phelps and McDonald, 1984; Phelps and McDonald, 1985; Cowardin, 1985a, 1985b, 1985c, 1986, 1987a, and 1987b.) The model has also been applied to medical response in mass casualty incidents (Morris, 1986) and training exercises (Ventimiglia, 1986).

Regardless of its variants, the model, as disaster researchers see it, advocates certain classic elements of a military, command-and-control arrangement. First, it proposes that ultimate decision making and authority should reside within one position at the scene of a minor fire, major fire, or disaster; that position is the incident commander. The incident commander is to be the highest ranking officer who is the first on the scene. However, the authority for control of the site can change as higher ranking officers arrive at the scene. In effect, at the discretion of the higher ranking officer, authority can be "bumped up" to a higher ranking officer. Conversely, with the withdrawal of the ranking officer from the site, the incident command position may be taken over by the highest ranking officer on the scene. Although authority and control can "bump up and down," some one individual is always in charge.

Second, the Incident Command System delegates tasks and responsibilities across five primary areas: command, operations, logistics, planning and finance. Individual officers are given responsibility for each area, provided that it is necessary. (Advocates of the Incident Command System argue that it should be developed in stages, and if logistics or planning commanders, for example, are not needed, they should not be designated at any

specific fire emergency, see Cowardin, 1985a.) Furthermore, within each area there are further delegations of responsibilities and activities. The operations coordinator, for example, is responsible for first-line fire suppression activity and the actions of various engine companies, strike teams, and task forces. On the other hand, the planning officer is responsible for such activities as documentation and demobilization.

Third, staging areas and sectoring are important elements of elaborate Incident Command Systems. In staging, fire fighting units gather at sites removed from the incident and, after briefing and organizing activities, move into the site to suppress the fire. In sectoring the area, the incident commander divides the site into sectors and assigns responsibility for operational activities to various operations commanders.

Fourth, the model utilizes such concepts as strike forces and task forces which are derived from the military. Originally, the notion of strike forces were developed by FIREScope to have a way to move resources from one county to another during major wildland fires. However, both concepts have been extended to include any units that may be held in reserve to be utilized as the incident commander deems necessary.

Finally, the model was developed to handle particular problems of conflicting terminology, multiple command in mutual-aid arrangements, and incompatible command structures. For example, the concept of Unified Command was established to handle the possible problem of jurisdictional disputes among various responding units (Cowardin,

1987b:30). Essentially, this concept involves the idea of voluntarily sharing command with other units at the site, including those from outside jurisdictions.

In this report we examine the efficacy of the Incident Command System in disaster situations. It must be recalled that the system was developed for a very specific purpose, i.e., to fight brush and forest fires that spread throughout a vast area, involved the activity of a variety of fire fighting units, and required extensive resources. We consider whether or not this model is generalizable to disaster situations of a different nature.

Up to this point we have presented the basic knowledge base available about police and fire department responses to disaster. The empirical findings and extensiveness of this knowledge is rather limited (although it is better than exists for some other disaster relevant groups such as lifeline groups or the military, see Anderson, 1968). It is also somewhat dated. In this report we partly consider if the earlier made observations about response are still valid. We analyze our eight case studies by focusing upon the predisaster structure and resources of the departments, the tasks undertaken during the disaster, the intraorganizational alterations that occur during the emergency period, and the interorganizational relationships that emerge during the event. In addition, an effort is also made to see if more recent predisaster changes in police and fire groups are also affecting present day disaster responses.

Chapter 4. BRIEF CASE STUDIES OF THE DISASTERS

The following brief case studies drawn from the eight disasters studied are presented to provide a background for the analysis and illustrate the nature of the data that were gathered. Obviously, they are pictures or "snap-shots" of the event. The case studies attempt to convey major observations; they do not present all of the detailed information that was gathered on the behavioral response in each disaster. In several instances, an entire volume could have been composed focusing only upon one of the events.

In each case study we first describe the general nature of the disaster and the magnitude of the impact. The community response to the event is then described, with specific emphasis being placed upon what was done by the local police and fire departments. (Localities, to protect confidentiality, are given pseudonyms). This is followed by a discussion of organizational problems and solutions. Finally, we also describe the status of pre disaster planning and its influence upon the disaster response patterns.

As was previously noted, the case studies include only one natural disaster situation (an almost concurrent tornado and flood event) and seven technological accidents. However, they do present an interesting set of events with regard to the size and complexity of the local police and fire departments. In five of the communities, the police and fire organizations are very large and complex, and possess numerous resources. In three of the localities, the local departments are small and possess few resources. The range is from tens to thousands of personnel in the work force. We begin our case

studies by first looking at the responses involving the smaller police and fire units. Subsequently, we examine the "megaforce" response in the larger cities. The systematic analyses and implications we drew from the data in the case studies is presented in the following chapter.

Case Study #1: Explosion and Evacuation in Carbon Hill

Carbon Hill is a town of about 17,000 nestled in hills along a major river valley. There are only three roads into this old coal mining community, which is experiencing economic decline. The city of Wilhelm, with a population of 50,000, is about ten miles away, as is a fixed site nuclear power generating station. Located within Carbon Hill is the Modern Metals manufacturing plant.

At 12:30 a.m., the overnight foreman at the plant caught a whiff of smoke and ozone. He immediately began searching for the source, because he realized that a fire in the plant could ignite the large quantities of highly toxic chemicals stored in the facility. It took several minutes to locate the blaze, but by that time it had already spread through the rafters of the ancient three story building.

The foreman immediately called the Carbon Hill volunteer fire fighting group and reported the fire. The fire also brought about the release of a toxic cloud of sulfuric acid. These events precipitated major fire suppression and evacuation activity. The initial call to the fire department was met with some skepticism since many previous false alarms had occurred at the old plant. However, within seconds, the firefighters did respond and had an engine and pump truck on the way to battle the fire.

The fire chief was notified at home about the fire. He was fully aware of the hazardous chemicals used there since he and some of his colleagues had previously compiled a list of the substances at the plant site and the effects that fire might have upon them.

At 12:33 a.m., the Chief called in a second alarm, and four more engines were dispatched to the scene. By this time the building was engulfed in flames. A third alarm was sounded at 12:34 a.m. At 12:39 two fire companies were called from the periphery of the community.

By 12:40 nearly 100 of the 210 active firefighters with the department were at, or in transit to, the fire. At this time also, additional fire departments in neighboring communities were notified of the impending danger associated with the fire. At 12:41 a.m., the Carbon Hill ladder truck's hydraulic system malfunctioned, making it impossible to put water onto the fire from overhead. A ladder truck was borrowed from a neighboring community.

By 12:45 a.m., the county emergency management agency was notified of the fire and the potential danger. The communication center was activated to serve as a clearinghouse for public information and rumor control.

Between 12:50 a.m. and 1:30 a.m. the Chief spoke to personnel at CHEMTREC, the state Environmental Protection Agency, and the state Department of Environmental Resources. There was general agreement that given the chemicals stored at the plant and the magnitude of the fire, the worst possible scenario should be anticipated. Based upon this information, the Chief notified the Mayor. At first, the Mayor attached little significance to the event (to him, it appeared to be a routine matter). But as the crisis intensified over the next half hour, and it became obvious that some of the corrosive substances in the plant were burning and emitting toxic fumes, he concluded that the town was in danger. At 2:21 a.m., the Mayor ordered the evacuation of the community and opened shelters in two nearby communities.

Fire companies from neighboring communities, who had been on stand by during the past few hours, were called to aid in the evacuation. Crews of firefighters patrolled the town in fire engines and sounded their sirens and utilized their on board public address systems to inform community residents about the evacuation. Eleven outside fire departments assisted in the evacuation.

The evacuation pattern preceded the drift of the plume of smoke emitted from the plant. A fortunate set of meteorological conditions present in the valley that morning may have aided the evacuation. A temperature inversion held much of the smoke close to the ground, but a slow (3-5 mph) veering wind pushed the smoke in a clockwise direction around the town. This circumstance allowed the evacuation effort to be carried out in quadrants, beginning with the west end of the city, and involving one section of the town at a time. As a result, the traffic flow was smooth and uncongested. Of the 17,000 residents, all but 1,000 or 2,000 evacuated. Of the approximately 16,000 evacuees, about 2,000 went to public shelters at area schools. The evacuation was completed in about two and a half hours. There were no major traffic jams, no reported accidents on the roads, no injuries (except to one firefighter who suffered dizziness while fighting the blaze) and no deaths.

A total of 92 ambulances were available during the event; many of them were used in the evacuation of a number of retirement complexes and hospitals. The majority of these ambulances were supplied by the county, while others came from surrounding counties and private ambulance services.

Roadblocks were established around the perimeter of the community and staffed by the state police. The Carbon Hill police department patrolled the nearly empty town in case there might be looting and vandalism. Earlier, the local police had assisted the visiting fire

departments in evacuating the community. In these efforts they were somewhat hampered. The local police department had only ten uniform officers and a Chief of Police. They were all called to duty but the department only has four police cars. As a result, a number of the officers used their private automobiles during the emergency. Members of the National Guard were called in and assisted with patrol duties also.

The fire at the factory was extinguished by 5:00 a.m. All fire suppression had been handled solely by the Carbon Hill department. However, because the local office of the EPA lacked the equipment and personnel to test air quality, the evacuation was not recalled until 4:45 p.m. that day. Members of the county emergency management agency and faculty from a college in a nearby community tested the air for toxicity. They determined that it was safe for the evacuees to return to their homes. The re-entry into the community went without incident.

The evacuation was successful and went quite well. With regard to the general evacuation, a number of factors interacted to bring about success. First, the event occurred early in the morning when family members were together in their homes. Since family members tend to evacuate as a unit, traffic congestion was lessened and efficiency was heightened because members did not have to leave jobs or school away from their residences. In addition, individuals were not yet engaged in other daily activities that could inhibit evacuation such as their employment and school roles.

Second, as noted, the meteorological conditions facilitated the evacuation process. Different areas were evacuated only as they were threatened. As a result, all 17,000 residents did not have to be evacuated simultaneously. Local officials were adamant in their view that the evacuation would have been far more difficult if this "staggered" pattern had not been possible. (This tactic of evacuating by quadrants was an emergent decision and was not based upon previous plans.)

Third, prior knowledge, mutual aid agreements, accurate hazard assessment and experience were all factors that aided the fire department in undertaking the evacuation. Although fire suppression was done solely by the local department, the mutual aid system worked well. Eleven neighboring fire departments assisted in the general evacuation. Furthermore, the prior tour of the plant by the Fire Chief and some of his men provided valuable information to the local department.

Fourth, previous planning efforts for the fixed site nuclear facility strongly helped in the evacuation. Carbon Hill lies just inside the 10-mile EPZ of the facility. It must be emphasized that the evacuation did not follow the nuclear plant evacuation plan. It did, however, follow a recently revised "all hazards" evacuation plan that incorporated many of the planning principles from the nuclear scenario. So while not based upon the nuclear plant plan, the evacuation benefitted from this previous planning activity. Local emergency

officials also had been involved in previous NRC-FEMA exercises and were familiar with role responsibilities. The local citizens were sensitive to warnings of threats and the possibility of having to evacuate. Evacuation information is included in brochures that are sent yearly to local citizens, as well as being printed in the phone book.

Some factors also worked against the evacuation. First, the event occurred in the early morning hours when most people were not likely to have their television or radio sets on. Although the local radio station did remain on the air throughout the morning, it may not have been as effective a conduit for distributing warnings as it could have been at other times. Second, there are only three roads leading out of the community. If the entire population of the community had tried to evacuate simultaneously, it is probable that traffic congestion would have been more severe.

What about specific fire and police concerns? With regard to the fire response, there were a number of positive elements. The actual response time was very quick. Mobilization occurred rather rapidly. Prior mutual aid understandings and knowledge of the plant were very good. Intraorganizational difficulties were few and fire suppression activities were effectively managed at the site. However, some problems were evident in other organizational activities.

First, the Carbon Hill fire department established no staging area at any safe distance from the fire. Witnesses reported that too many firefighters were stationed too near the fire (within 50 yards), where they could have been exposed to the toxic fumes.

Second, there were problems with getting needed resources. The local fire department lacked a sufficient supply of breathing apparatus that are rather necessary in toxic fires. Only 20 tanks were available for the force of 100 firefighters who initially arrived at the scene. This shortage limited the number of firefighters who could directly engage in fire suppression and exposed others to the toxic hazard.

Third, although the earlier surveillance of the plant and the general community planning for nuclear accidents was very beneficial, the local fire department is not highly trained, particularly in the skills and experience needed to combat chemical fires. The economic and demographic conditions in the community compounded this problem. Carbon Hill is an aging, economically depressed town with a declining tax base. Little money is available for any firefighter or police training or equipment.

Fourth, the fire department had some interorganizational problems. These did not concern its relationships with neighboring departments; the mutual aid agreements worked quite well. Most of the difficulties involved interaction with other units from outside of the community. For example, the state Department of Environmental Resources failed to carry out the task of air quality monitoring; a local professor with

county emergency management agency personnel performed this vital function. Also, the assistance of CHEMTREC was solicited. However, because exact information on the specific chemicals involved and the quantity of those chemicals was lacking, CHEMTREC could not offer specific advice. It simply recommended that they prepare for a "worst case scenario."

Police activity was limited during the course of the accident to some assistance in the evacuation effort and general patrol duties. In carrying out these traditional tasks, nevertheless, the police were pushed to the limit of their capability. The department only has eleven uniformed officers and four vehicles. While all personnel were mobilized, the department is somewhat understaffed and underequipped for undertaking a major evacuation. The state police did assist with 30 officers. The actual traffic flow and patrol duties presented no major problems for the local department since most of the community had evacuated. There were few police related problems, in part because of the nature of the event and the evacuation, and also because the police limited their involvement to specific, traditional tasks that could be performed with their limited forces.

The relevant community organizations sounded all of the sirens in the community to warn the residents. However, many of the residents did not know what the activated sirens were indicating. Some assumed that an accident had occurred at the nuclear power plant. Sirens are an inherently ambiguous warning message and confusion can result in a less effective response unless specific, clear information is provided to the citizens. However, especially in a small community they are likely to alert citizens that something is wrong and lead to efforts to find out more information, as happened in this case

Finally, there was a lack of much communication or interaction, between the local police and fire departments during the incident. In this event, this lack of contact did not appear to bring about any serious problems. But in a more demanding disaster context, such organizational lack of interaction could be very detrimental to an effective response.

In sum, the evacuation was well handled. The event does indicate the benefits of prior planning and helpful situational contingencies. Both fire and police departments engaged in limited, traditional activities and were effective in this focused disaster. But a similar lack of resources, poor training, and interorganizational difficulties could prove to be very detrimental in a disastrous event of greater magnitude.

Case Study #2: Gas Spill in Astor

Astor is one of three boroughs in Williams Township, a densely populated area of Borton county. A previously small, rural community, it is now engulfed by metropolitan sprawl and suburbanization. It is awash in a spaghetti like maze of freeways, turnpikes and interstate

highways. The population of the borough is about 50,000; however, Astor is basically a nonresidential community. Its economic base rests upon two huge shopping malls, a large number of hotels, resorts and convention centers, and several clusters of industrial plants. During the weekday its population doubles to over 100,000 as people pour into its malls and industrial parks.

While the three boroughs are governed centrally by the township, each of them maintains control of its own separate volunteer fire department. Funding and equipment are provided by the township to the volunteer forces in Astor, North Astor, and South Astor. The three borough departments are rather small, with the Astor Fire Department having 75 personnel and eight vehicles and the other two departments having about 35 personnel and five pieces of equipment. The township police force, which serves Astor, employs about 50 people.

There is also a Fire-Police unit. It is a county organization made up of volunteers assigned to various fire departments. When a fire is reported the members are dispatched to the scene to maintain perimeter security. However, they have no constabulary powers and carry no firearms.

On a warm fall morning at about 10:30 a.m., a worker at Anderson Tool and Die company in the south side of Astor discovered that an underground gasoline transmission pipeline on the factory's property had ruptured and was pouring gasoline over the plant's grounds. The employee immediately called the Borton county emergency dispatching service which handles all police, fire and ambulance calls. He informed the dispatcher that a "gas leak" had occurred and requested that a fire unit be sent to the plant. The message was relayed to the Astor volunteer fire department, which promptly dispatched two pump trucks (one from each of its two stations) to the scene. The township police were also notified, and they sent one squad car to the site.

It was assumed that a natural gas leak was in progress and that the dispatched forces would be adequate for managing the leak. However, the responding firefighters found a massive geyser of gasoline issuing from the ground. The Chief (who was at his regular work at the time) was called and told of the seriousness of the situation. Immediately he mobilized all remaining equipment and personnel and ordered that all available fire retardant foam be brought to the scene. The volunteer departments in North Astor and South Astor were also mobilized.

By this time the large oil company that owned the pipeline had located the source of the problem and closed the pipeline. However, the leak had already released at least 250,000 gallons of gasoline into the ground. Some later estimates put the leak at as much as 500,000 gallons, only 50,000 of which were ever eventually retrieved.

With the issuance of the general alarm, the Williams Township Fire Marshall, a full time professional employee who also serves as Disaster Coordinator for the township, was called into the response.

He was joined by three township agencies, namely the police department, the department of public works, and the municipal government. In addition, the state highway patrol, the state Department of Environmental Resources, the state Environmental Protection Agency, a Hazmat unit from a neighboring township, and a number of private chemical control businesses, and other fire companies were mobilized.

The state highway patrol closed the main highways (including a major interstate route) that ran through the township. Traffic was rerouted through other towns in the area. The majority of the responding outside fire companies supplied Fire-Police, non-firefighting personnel who were used to staff the cordons around the perimeter of the danger zone. Also, a few completely staffed firefighting units from nearby towns went to the vacated township fire houses to act as emergency backup support.

The Chief of the Astor Fire Department felt that it was necessary to evacuate the area around the site after it was determined that at hundreds of thousands of gallons of gasoline had escaped into the soil, a creek, and the local storm sewer system. Highly combustible gasoline fumes spread throughout the area. In conjunction with the Fire Marshall and Township Manager, the evacuation process was started. The three borough fire departments were assisted by the township police in this effort.

The evacuated area included a large portion of Astor and the two mammoth shopping malls. Fortunately, due to the time of day, many of the local residents were not home, and the shopping malls had not filled yet with customers. In all, about 200 households, an unspecified number of nearby nursing home residents, and an undetermined number of mall employees and customers were evacuated. Most of the evacuees went to stay with relatives or in hotels offered for the duration of the event by local hotel managers. Non residents went to their homes and businesses outside the area. Less than 30 evacuees utilized the Red Cross shelter that was established at a local hospital.

In general, the evacuation went smoothly and quickly. However, there were a few difficulties. First, there was no clear cut plan for the departure of the evacuees from the area which resulted in some traffic congestion problems. Second, some shoppers had been bussed to the malls. Transportation was provided by the township, but it was not clear where those moved should be placed. At first they were put in either the Astor fire house or the township municipal building. However, the firehouse was located in an area contaminated by the leak. Therefore, all evacuees were moved again, this time to a local high school.

Members of the Astor fire department undertook the evacuation of the malls and the surrounding neighborhoods. Other members of the department in order to prevent possible combustion began spreading flame retardant foam over the gasoline soaked area. This local department

was the group most involved in fire prevention at the actual scene of the leak. It continued foaming activity until later in the day. At that time, a determination was made that foaming should cease in order that clean up efforts could be hastened. The Chief of the Astor fire department requested that more personnel be brought to the site to relieve those who had been on duty since the onset of the crisis; more volunteer firefighters arrived in the late afternoon. Furthermore, "light units" were requested and were utilized until the morning.

The next morning, while checking for vapor content, it was discovered that there were still high levels around one of the malls, but the source was unknown. The fire department requested that they be provided a set of ground and building plans for the mall. After a considerable period of time the plans were made available and the organization began flushing operations and the area was cleared of the vapors. The fire department remained on the scene until about noon of the following day, at which time the leakage had been contained and clean up was well underway.

The North Astor fire department was mainly responsible for conducting foaming operations at a nearby field and creek bed. The South Astor unit later oversaw the construction of a temporary dam at the creek to retain the ground flow of the gasoline. Both units also assisted in the evacuation.

The Williams township police department initially secured the area in which the leak was occurring and established a command post at one of the malls. They also placed a "Code O" into effect, thereby placing nearby police departments on a stand by alert. However, during the event, the Williams township police department did not request the assistance of other police organizations. (Police in other communities, however, were forewarned that they would be receiving extra traffic as a result of the closing of some major highways.)

The township police department limited its activity. It provided assistance in evacuating the malls and residential areas through the issuing of warnings by officers on foot and from police cars, and in establishing roadblocks and security in the area. The latter task was accomplished with the assistance of members of the county Fire-Police who actually staffed the roadblocks. (The lack of mobilization and limited response of the police was questioned by a number of the fire personnel who felt that additional activities might have been warranted.)

The state highway patrol barricaded and patrolled the closed part of the interstate highway and the Fire-Police handled the security checkpoints and roadblocks around the periphery of the evacuated area and the danger zone. Some monitoring of traffic was done by the township police department.

By noon of the following day, most of the cleanup had been completed and a determination was made that the residents could return to their

homes. A 12:30 p.m. news conference was held to announce the end of the emergency. The two malls, residential areas, industrial sites, and the various highways were reopened for public use again.

The event certainly did not constitute a major or massive disaster in that there were no injuries or deaths. But, even though there was no property damage of any significance, there was considerable disruption of ongoing everyday social routines and economic hardship was undergone by the store owners and businesses that had to close. To a significant degree, the action of the various units in responding to the event are praiseworthy. A potentially very dangerous situation had been managed. No fire developed. The evacuation removed the endangered population effectively.

Even though the event is somewhat difficult to classify as a major disaster, it did nevertheless, indicate some problematic elements that could prove to be significant in a disaster of greater magnitude. First, there were some problems in the area of task performance. Certainly, both the police and fire units engaged in traditional tasks and did not extend their activity into unfamiliar territory.

However, the police had problems with securing and cordoning the affected area. No pass system was ever developed. The staffing of the roadblocks was undertaken by Fire-Police who used discretionary powers. Entrance into the area was based on "knowledge" of the individual, some sort of credential, or a uniform. An attempt was made to bar journalists and sightseers. In fact, some emergency response personnel, such as a local Red Cross official with credentials and a vehicle that was clearly marked were initially not allowed access into the area.

Also, residents expressed some unhappiness with how they were handled. Actually, the cordoning of the area was less than perfect. One of the complaints of the firefighters concerned the proliferation of mass media representatives around the site. In addition, when residents returned to their homes many found packages distributed by a local legal firm attached to their front doors (Enclosed in the packages was information on steps to take to institute a lawsuit). Clearly, the package distributors had managed to evade the perimeter security set up by Fire-Police volunteers.

Another task problem involved the establishment of a field command post. The post was established near the site of the pipeline break on top of one of the mall's parking garages. This location may have been unwise. The creek, which was carrying away much of the gasoline from the leak, flows through an immense culvert which lies buried beneath the garage. It was observed after the fact that if the gasoline and its fumes had ignited, the entire complex could have been engulfed. The choice of the location was made by the Fire Marshall, actually over the protestations of the Fire Chief.

With regard to intraorganizational problems, there was the issue of securing enough personnel to maintain the strength of the volunteer firefighters. Being a volunteer organization, it is not easy for the firefighters simply to leave their normal work, particularly for an event that lasted over 24 hours. Thus, instances arose where some of the early volunteers worked for many hours. These long working hours may have resulted in fatigue and a subsequent loss of effectiveness. Furthermore, as noted by an informant from a fire department, out of the total number of personnel involved in firefighting in the area, "about 50 percent can be counted on to come to most of the calls--in this case, more than usual came out."

Most of the problems, however, were of an interorganizational nature. There were some difficulties in communication among the responding units. The fire departments each have separate radio "bands" that are not compatible. Much effort was expended in changing channels in order for the various fire units to communicate. The central dispatch center for the county allowed them to contact each other. But the police department has a separate communication center. In order to communicate with one another, the police and fire departments must use the county communications center. Each of the responding units had "hand held" communication devices. These facilitated communication. However, during the latter stages of the response, many of these units lost power, and the responders had to use either the larger system or word of mouth communication.

Furthermore, some conflict developed with regard to authority and the decision making process. The Township Manager is identified as the central figure for disaster response, but he functioned mainly as a public information officer in this situation since he delegated his responsibility to the Fire Marshall, a full-time employee. However, most firefighters at the scene flatly said that they took orders from only one person--the Chief of the Astor Fire Department. Conversely, other non-fire organizations felt that the Fire Marshall had handled the overall coordination. Certain conflicts in the authority structure were evident. In the township system, in large scale emergencies, the township Fire Marshal is the designated coordinator charged with making command decisions and assigning tasks. However, the Fire Chief, an expert in explosives, perceived that he had the needed expertise in this incident. The majority of the firefighters followed his orders. In fact, virtually all command decisions concerning the handling of the fire prevention and gasoline containment efforts were made and transmitted by the Astor Fire Chief, occasionally countermanning the Fire Marshall. Those decisions not involving fire related matters that were made by the Fire Marshall appeared to have been followed but perhaps 90 percent of the responders were firefighters and fire police.

The conflict that arose apparently was between full time responders and volunteers. The fire department volunteer personnel involved had few positive comments to make about the Fire Marshall, while they praised the efforts of the Astor Fire Chief. Conversely, full time

personnel felt that the performance of the Fire Marshall was central to the effectiveness of the response.

Finally, the level of emergency preparedness within the community was fairly good. For the individual fire departments, the state of preparedness is fairly high. Firefighters train regularly at the county fire academy and attend seminars and courses at a regional fire college. The departments also regularly conduct public education programs and they also frequently tour local business and industrial establishments to learn about the physical layouts and potential site hazards.

But within the overall community the situation was less positive. A disaster plan had only recently been completed by the Fire Marshall for the township. The plan is a general, multi-hazard document. However, at the time of the gasoline leak, only three or four copies of the new plan were available. (Only the Fire Marshall, the Town Manager and the Director of Public Works apparently had copies.) There was disagreement among the organizational responders concerning whether or not the plan had been put into effect. In addition, a number of operational personnel were, at best, only vaguely aware that a plan even existed. Others had no knowledge of it at all. The absence of involvement of police and fire department members in the planning process, and their lack of information about the document--not to mention the obvious lack of exercising--may create some severe difficulties when it is time to implement these plans.

In sum, the gasoline leak was successfully contained. However, even though the event did not occasion great stress on the local police and fire groups, it does indicate that a variety of intraorganizational, interorganizational and task problems can still emerge, even in less severe disaster contexts.

Case Study #3: A Tornado and Flood Strike Bunkus

The city of Bunkus has a population of about 30,000. It lies about eight miles from Porter, a large city of over 200,000 in an adjoining state. The Bunkus police department has about 50 full time officers and 15 vehicles. The local fire department has a full time, professional force of about 50 firefighters, eight trucks, including five front line pumpers, and four fire stations. Within a period of ten days, this small city was struck by a severe tornado and a property damaging flash flood. The tornado first touched down in the south side of the town and continued to travel in a northeasterly direction cutting a swath of destruction, leaving six people dead, more than one hundred injured, and hundreds of homes destroyed. Ten days later, on a holiday morning, heavy rain resulted in the flooding of certain low lying, residential areas of the city. Twelve inches of rain fell within 24 hours. Although there were no deaths, 600 homes suffered flood damage and about 1,000 people were temporarily evacuated from the areas. Most of our attention will be given to the tornado, which brought about considerable stress for the community.

A tornado watch had been issued for the Bunkus area during the day, but in this region of the country that is not an unusual event. In the evening, many of the residents were among the over 9,000 people at the local race track on its closing night. Shortly after the tornado watch was lifted, a violent twister touched down in the south part of town. It ripped through a residential area on its northeasterly track, smashed into the downtown business area, continued through the northeast residential district, smashed a commercial area near the interstate highway and passed within a few hundred yards of the race track before it disappeared into the dark sky.

The first notice that the Bunkus police department had of the tornado came at 9:34 p.m. from a police sergeant on the south side of town who had been sucked out of his patrol car by the tornado. A patrolman who was working dispatch that evening immediately sent patrol personnel to assist the sergeant, placed a call to the Bunkus fire department, and put out a blind call to other emergency organizations about the tornado. Thus began a frantic, six hour period of search and rescue, casualty care, and security and patrol activity on the part of both the local police and fire departments. Power was lost at the police station, but an emergency generator supplied back up power for the radio system. The five phone lines were immediately clogged with calls. Attempts were made to contact off duty officers, which was particularly problematic for the fire department which could not make outside calls.

However, mobilization of personnel was quite rapid as police officers and firefighters came to the police station and the main fire house. Within the police department, almost all personnel responded, with the notable exception of the Chief of Police, who did not come to the station until the next morning. But these were not the only persons who came to help. Within hours, volunteers from the county sheriff, neighboring counties, other areas of the state, and neighboring states poured into the town. Also, a request for assistance was made to Porter, whose Mayor also came to the disaster scene and provided some fire support and a force of 14 officers from the West Precinct of Porter.

The first few hours of the response were highlighted by extensive, well meaning, helping behavior. Nevertheless, they were also marked by considerable confusion, a lack of coordination, and a "seat of the pants," unplanned, emergency operation. The community has no established Emergency Operations Center (EOC). A make shift EOC was established at the police station at about 10:00 p.m. when the Mayor arrived. Convergence of people and information was massive. By 10:30 there were an estimated 250-300 volunteers from three states, numerous municipalities and counties in the EOC. Many were strangers who had not worked together previously. The police radio room was under extreme stress. All phone lines were clogged; anyone who could provide assistance began working in the radio room, including one woman who lived over 100 miles away who happened to be driving through

the community at the time of the tornado. This woman went to the police station for assistance and was put to work in the radio room of the department, where she worked for four hours receiving outside calls.

In the absence of the Chief of Police, an inspector, two captains and a lieutenant assumed responsibilities for varied, and fragmented activities. Two field command posts emerged. In the south, one ranking officer placed his squad car at a major intersection and began to direct search and rescue activity in the southern area. The off duty inspector arrived at about 10 p.m., and fifteen minutes later he went to the north part of town where the interstate highway, a truck stop, apartments and a motel had been hit. His patrol car became a mobile command post for the north. Police personnel would be dispatched to this location and the inspector would tell them what areas needed to be searched, or he would contact the captain at the south command post to see if he needed more personnel--none were requested. There was communication between the posts, but officers did not report back to the posts after they began working in the field. Instead, they would work individually, or if they had radios, they would communicate with the dispatcher.

The search and rescue activity during the first few hours was frantic and not coordinated in any overall fashion. Citizen volunteers, members of the county search and rescue team, local police and fire personnel, and outside law enforcement units operated with considerable independence and autonomy. For example, the 14 member unit from the Porter Police Department went to the north command post and worked independently of other units. They were requested to search an apartment building, which they did; however, they maintained control over their own personnel. All activity was also hindered by traffic and personnel convergence. The streets were clogged with debris and vehicles. (It took one firefighter over 30 minutes to go seven blocks in a marked, emergency vehicle.) Citizens, spectators and victims swarmed throughout the area.

By about 10:30 p.m. the nascent EOC was operating in the police station. The mayor, the city engineer, the fire chief, and a police lieutenant who served as both public information officer and the mayor's liaison to the dispatch room, served as a central coordinating body. Various county officials, including the county emergency management coordinator, state officials, journalists, and volunteers also crowded into the small area. The mayor assumed control of the response. He attempted to direct all facets of the operation, including search and rescue, traffic control, security, the delivery of emergency medical services, the provision of shelters, and the acquisition of outside assistance. As one respondent noted, "wherever the mayor was--that was the EOC."

Meanwhile, in the field, there were major problems of coordination and communication among the responding units. Operating on different radio frequencies, police and fire units could not communicate

directly with each other. (The city of Porter provided a communication unit with an integrated system to try and alleviate the communication problem.) The mobile field command posts were perhaps "too mobile." One responder noted that he was never able to locate the south command post. The main fire station became the major staging area for outside responders. Twenty one ambulances arrived at the station--the Bunkus fire department EMS unit has two--but many were not used because most of the victims had already been taken to medical treatment by other means. Considerable effort was expended by the officer in charge of the fire station (the Fire Chief was with the mayor at the EOC) in inventorying the available resources and personnel from outside units who had converged on the station.

Problems of coordination were also evident in the medical service area. No field triage was established; injured victims arrived at the local hospital in private cars, ambulances, police and fire vehicles, and on foot. The area around the hospital was congested and little control over patient flow was ever established. Over 100 patients arrived for treatment. Two police officers and a fire department paramedic were placed outside the hospital to assist in the coordination of the injured arriving by different ambulances. However, because of the lack of triage in the field and the uncoordinated flow of patients into the hospital, these liaison personnel had limited knowledge about what was occurring.

There were similar problems with respect to security and traffic control. Streets were not cordoned and roadblocks were not established until after a considerable time. As a result, congestion in the impact area was extreme. When roadblocks were finally established, they were manned by a variety of personnel from different agencies, including the Bunkus police, state police, some firefighting units, and even the county search and rescue team. The latter group attempted to withdraw from this security activity as soon as possible and commence their search and rescue activity. No pass system was ever established. Anyone who desired to enter cordoned areas either showed driver's licenses or other forms of identification. Discretion for entrance was left to individual officers. This led to problems. For example, one uniformed member of the county search and rescue team in a marked vehicle was temporarily denied access to the impacted area.

After midnight, the mayor, his closest advisors, and a member of the local media toured the more damaged zones. Shortly after this tour, around 2:00 a.m., the mayor ordered another search of the area. This search was more coordinated than the emergent activity that had occurred during the preceding four hours. At about 4:00 a.m., search and rescue activity was suspended until daybreak. With the arrival of the National Guard, cordoning and perimeter control were given to them, and the local police department withdrew from this activity. At approximately 6:30 a.m., a final search of the impacted area was undertaken. Teams of 8-10 police and fire personnel with dogs canvassed the destroyed areas.

After this early morning search, the Bunkus police department's major concern shifted to security. Five arrests for looting were made within the early morning hours. Those arrested were arraigned, tried, found guilty, fined \$1,000 and sentenced to one year in jail within 48 hours. The Bunkus police department remained on extended shifts until about four days after the event.

The Bunkus fire department first became aware of the tornado when they monitored the police frequency. They were called by the police at about 9:35 p.m., reporting a personal injury. The fire department dispatched their paramedic unit. Moments later, the city 911 lines, located in the dispatch room of the main fire station, began to receive a number of tornado related calls. The lieutenant on duty at the main fire station ordered the dispatching of equipment from the four stations. He also attempted to call by telephone some off duty personnel, but all phone lines, except the backup lines for incoming emergency calls, were down. Power was lost in all stations but the dispatcher was able to start the emergency generator at the main station. By about 9:45 p.m., the shift captain and the Fire Chief had arrived at the main station. The captain went to the police station to use their phone to try to call in off duty personnel, but most came on their own by about 10:30. The lieutenant meanwhile had gone into the field, responding to a call reporting people trapped at a nursing home. This began a pattern that was to occur during the first hour of the fire response. Units would respond to calls, do what could be done in that area, until dispatched to another scene.

The chief went into the field for about 45 minutes at about 10:15 p.m., leaving the fire department inspector in command of operations. The inspector remained in this position throughout the night. In the meantime, volunteers from fire and other organizations from the county and beyond began to converge on the fire department. At about 11:00 p.m., the Fire Chief proceeded to the police station where he joined the mayor, the city engineer, and a police lieutenant at the informal emergency operations center that was forming.

The pattern of responding to individual calls gradually developed into search and rescue efforts by individual units. Later in the night it evolved into a more organized search and rescue operation by the fire department itself. During this stage, fire personnel and volunteers who converged on the fire station were sent into the field, presumably to the police command posts, where they were given locations to check. This activity, however, was hindered because some fire personnel could not locate the field command posts. Once given instructions, the fire people would report to their own dispatcher and not to the field command posts, a condition necessitated because their radio equipment was not compatible with police equipment.

The fire department participated in the more coordinated search effort run by the mayor which began at about 2:00 a.m., and in the final daylight search conducted the following morning. The fire department

returned to more or less normal operations by noon on the second day when off duty personnel were sent home.

In addition to search and rescue, the fire department also undertook such tasks as responding to fire reports (mostly false alarms), shutting off broken gas lines, transporting injured, dispatching outside ambulances, and checking out possible hazardous materials at the truck stop.

Only one fire occurred during the emergency period and it was not related directly to the tornado--a fire began in a house. Due to traffic congestion and debris, firefighting units were unable to get to the scene before the house was destroyed. Actually the volunteer units who had come on a mutual aid basis to the fire station were hesitant to respond to this lone fire situation and waited for the Bunkus department to handle it.

In general, the police and fire effort in Bunkus was commendable. The individual officers and firefighters engaged in long, heroic actions. However, the response was hindered by a number of problems in many areas such as resources, planning, communication, and coordination. First, the response was ad hoc in nature. Although a county disaster plan existed, it was not used. There are a number of reasons for this lack of attention to the existing plan which had been developed by the state emergency management agency for the county. It was a generic, "fill in the blank" document. The local police, fire and other emergency organizations had practically no role in developing the plan, and thus, had minimal familiarity with it and little reason to regard it as pertinent in the disaster. The situation was a classic case of the problems inherent in product oriented planning, as opposed to process oriented planning, that is where concern was more in having a document than in working through a planning process. Also, the county emergency management coordinator, who had authored the plan, was not centrally involved in the response. In fact, he was somewhat ignored and was not a key player in the decision making process as the mayor assumed command.

Resource utilization was also problematic. Certain resources were in short supply, such as needed communication equipment and vehicles. On the other hand, some available equipment, such as a police van, were not used. In addition, once the convergence of outside forces began, the problems were generally those of too many volunteers and equipment.

Both the police and fire departments experienced severe internal and external communication problems. Available telephone lines were jammed. Radio rooms were staffed with volunteers. The ability to communicate directly with outside units was severely limited. With regard to task performance, once again, both the police and fire departments tended to limit themselves to traditional tasks, i.e., search and rescue, security, and patrol for the police; and search and rescue, medical transportation, and fire prevention for the fire

department. The search and rescue activity was effective. In parallel with a massive effort by volunteer citizens and outside groups, the impacted areas were searched at least four times. However, it was not an efficient effort. In addition, the lack of a preplanned and organized pass system and cordoning arrangement contributed significantly to the traffic and personnel convergence in the area.

The police department, much more than the fire department, faced intraorganizational problems of exercise of authority and decision making. The authority structure that developed was ad hoc in nature. In the absence of the Chief, a collective effort was begun by a number of different senior officers to handle specific, limited problems. There was never any overall coordination of department activities during the first four hours. Only after 2:00 a.m. was some coordination achieved, and this was interorganizational coordination brought about by the activities of the mayor and his advisors. Furthermore, the normal task structure in the department was disrupted. The utilization of untrained citizens in the radio room, persons who happened to walk into the station from the street, is indicative of the severe alterations that occurred in normal operations.

Finally, both police departments and fire departments faced some interorganizational problems. The fire department did not develop any liaison with the mass media liaison. The police assigned a lieutenant to this task. Obtaining information on what had happened was especially difficult for mass media representatives who came from outside Bunkus. Interaction with outside agencies, though generally supportive and beneficial, was also hindered by a lack of prior planning, knowledge of the resources of the outside units, and some problems of autonomy and control of the various units.

Ten days after the tornado, a flash flood inundated neighborhoods on the west and east end of the city. The flooding occurred in the early morning hours on a major holiday. The mayor once again assumed command of the emergency response. In doing so, he implemented what he perceived as the major lesson he had learned from the tornado. Instead of establishing the EOC in the midst of the crowded, noisy police station, he isolated himself with the city engineer and the fire chief in his office in city hall. There, with the utilization of a radio, he directed the efforts.

Flooding in this region of the country is quite common. Partly as a result of this some neighborhoods have developed somewhat of a "flood subculture" for handling the problem. Even though it was a holiday, both police and fire personnel quickly responded. The police activity was limited to cordoning areas. The fire department was more involved in warning and search and rescue activity. The fire department also assisted the county search and rescue team and a Coast Guard unit in rescuing victims from their homes. Most of the 1,000 victims were evacuated from their homes by noon. Boats were volunteered by citizens in voluminous numbers, probably more than were needed. While

some interorganizational conflicts occurred over jurisdiction and the use of power boats, in general, the rescue effort was rather successful.

Overall, the response to the flood was much more efficient and effective than that carried out for the tornado. While it might be tempting to infer that the tornado experience had provided a "learning situation" for the emergency management personnel, this conclusion is true only to a point. While the mayor did relocate the EOC, and recent experience in interorganizational relationships can smooth future interactions, there is no evidence of any systematic, after action analysis of the tornado that lead to an improved flood response. The county plan was not utilized to any great extent. In fact, a number of local response personnel expressed the opinion that "you can't plan for a disaster." Probably the better response and fewer problems experienced by the Bunkus police and fire departments resulted not from any lessons learned in the tornado, but from the fact that the flood was a disaster of significantly less scale.

Overall, with regard to the tornado, lacking a clearly coordinated, planned response, the technique which was used in Bunkus could be termed "overkill emergency management." In other words, send as many people as possible into a disaster area and search as often as possible. The people in Bunkus, given the lack of interest in emergency planning in the community, can probably expect a similar response in future emergencies.

Case Study #4: Hotel Fire in Solara Beach

As usual, the hot sun baked the sands along the beaches as tourists basked near their hotels. It was the height of the tourist season in the resort city of Solara Beach. For the approximately 500,000 residents of the community, and the additional 600,000 people in the metropolitan area, it was a special time. Tomorrow was a major holiday, and by early afternoon of the eve of the special day, revelry and celebration had already begun.

During the morning, however, several guests at the Algonquin Hotel received phone calls in their room threatening that they would be "burned out." At about 1:40 p.m., the Solara Beach police responded to an anonymous caller who said that a bomb had been planted in the Algonquin. Two police officers went to the hotel to investigate. They were assured by hotel security that everything was fine. They left without searching the premises or ordering an evacuation. The 1,000 guests in the hotel continued their holiday activities.

At approximately 3:25 p.m., a rapidly spreading fire, accompanied by an undetermined number of explosions, tore through the lower and mezzanine levels. The mezzanine level contained the main lobby of the hotel and the gambling casino. During the previous month, three small fires had occurred in the hotel. On all three occasions, the Solara Beach fire department came to the hotel and the fires were quickly

extinguished without loss of life. This day would be different. This fire eventually claimed the lives of 96 persons, and injured about 100 others. In this depiction of the event, our primary focus will be upon the Solara Beach fire department. However, some observations related to the police response will also be given.

The Solara Beach fire department is a rather large force of 1,400 paid firefighters, 40 ranking officers, and 130 sergeants housed in 92 stations. At approximately 3:40 p.m., the fire department received its first call about the fire, apparently from a worker at the hotel. Two pump trucks and one rescue truck arrived at the scene within five minutes. They immediately started lines to the hotel and called for reinforcements.

Within ten minutes, traffic and people converged upon the hotel area and the fire department had to bring their equipment and personnel through the congested area. By 4:15 six pump trucks, two ladder trucks and two rescue trucks were on the scene. Four trucks pumped water on the fire while two trucks remained on the scene on standby. Much of their effort was aimed at hosing down the casino lobby area to prevent the fire from spreading further. The police, however, having been given orders not to let anyone enter the building, temporarily even kept firefighters armed with hoses on the outside.

Firefighters went into the building to both drench the interior and to help with the rescue effort. A total of approximately 60 firefighters and 20 officers came to the site. The Fire Chief maintained contact with his personnel by walkie talkie radio. A problem arose, however, during the rescue effort when people began to appear on the balconies of the high rise structure. The Fire Chief had no loud-speaker to inform these people that help was on the way. The Chief's car was equipped with a loud speaker but the traffic around the hotel made it impossible to get the vehicle close enough to the building to be of use. Finally, a civil defense loud speaker was used to communicate with the trapped individuals.

Within about one hour of the arrival of the fire department in force, the fire was declared under control at 5:35 pm. The fire department left four trucks on the scene at the Algonquin for the next two days in case reignition of the fire occurred during the period of recovering the bodies. The last piece of apparatus left on the third day.

Carrying out the tasks of fire suppression and search and rescue presented few intraorganizational problems for the Solara Beach Fire Department. However, a number of interorganizational difficulties exacerbated their efforts. First, there were severe problems of inter organizational coordination among the various responding units. Each responding organization undertook their traditional, normal tasks; however, no one organization stepped beyond its normal boundaries to assume a coordinating role. For example, separate command posts were established by the fire, police, civil defense, and rescue teams. This pattern resulted in an ad hoc response with duplication of effort

and miscommunication among the organizations at the scene. As noted, the police department actually kept firemen with hoses out of the building, due to a communication miscue. Duplication of effort was evidenced by a number of semi-independent rescue groups that entered and searched the main tower of the hotel.

Second, related to this lack of interorganizational coordination, there was confusion regarding authority at the scene. The fire department claimed responsibility for the scene while the fire burned, yet their perception that they were in charge was not shared by other response organizations who claimed that they instead exercised such authority. Furthermore, after the fire was brought under control, the fire department indicated that they passed control of the scene to the police department. However, other organizations indicated that they believed that site control was given to either the Justice Agency or the State Agency at that time. These divergent responses indicate not only a lack of clear lines of authority, but also the lack of extensive interorganizational communication among the various local responding agencies.

Third, fire suppression activities were hindered due to the massive traffic and pedestrian congestion that engulfed the fire site. The police had been informed of the fire at approximately 3:30 p.m. Immediately, all available personnel, approximately 400 officers, were sent to the area around the hotel for purposes of traffic and crowd control. Road blocks were erected and maintained and the Chief of Police at approximately 4:00 p.m., issued orders that only police and firefighting personnel should be given access to the burning building. However, the cordoning did not prove to be very effective, as congestion was extreme. For the fire department, it posed such problems as the inability to use a loudspeaker and a delay in the arrival of some emergency equipment.

As was previously noted, the fire department is large, and this event, although a "major fire," did not overwhelm the available personnel or equipment of the department. In fact, two other fire runs were made during the event which were routinely handled by other units in outlying areas of the city. However, some specific resource problems were evident. For example, SCBA, or self contained breathing apparatus, gear was in short supply for the firefighters involved in rescue activity and they also faced a shortage of fire resistant rope for their rescue effort.

The local civil defence office in Solara Beach is fairly active. A community disaster plan exists. The plan is a standard all hazards approach to disasters. It is exercised once a year. However, while a plan can attempt to foster interorganizational coordination, it cannot dictate it during a disaster. As this case illustrates, a fragmented, uncoordinated response can occur even in the presence of planning.

In this situation the fire itself was suppressed within about one hour. Although the number of victims was high, the fire suppression

activities and the rescue work were accomplished in a rather rapid and effective fashion. After an initial, brief period of some confusion regarding operations, the intraorganizational problems of the fire department were few. External relationships with other organizations, however, were somewhat problematical.

Case Study #5: A Plane Crash in Trotter

It was a lazy summer weekend evening. At approximately 8:45 p.m., the commercial airliner began its takeoff from the Municipal Airport. Its crew of six and 149 passengers were barely airborne when the plane began to lose altitude and list. Within a minute, the plane struck a light pole at a rental car agency, hit a competing rental car agency's building and crashed into the intersection of Brown and Evening roads. The wreckage slid north on Brown Road and hit a railroad bridge resulting in the total destruction of the aircraft. Debris was strewn one-half mile north of this point under an interstate highway bridge.

The crash resulted in the deaths of all persons on board the aircraft, except for one survivor. On the ground, three vehicles were struck resulting in two more deaths and one injury; six additional persons were injured by fire or debris.

The crash precipitated a massive emergency response by local and regional police and fire forces. It was a response that, on the one hand, was rather brief and well handled. On the other hand, it was a response that was plagued by problems of interorganizational relations, boundary relationships, and a somewhat inefficient use of massive resources.

To understand what happened in the response, it is necessary to discuss the different activities of two fire departments and three law enforcement agencies. The location of the crash site posed some interesting questions about legal responsibility for the response. The airport is owned and operated by Lucas County. The airport, however, is surrounded by the city of Trotter which has a population of about 25,000, but resides within a large metropolitan area. Trotter has its own police and fire departments with about 50 persons in each. The aircraft hit county property while in the air. Its ground impact was on a county road in the city of Trotter. As the plane slid down the highway, much of the debris came to rest under a state highway. This situation resulted in some initial confusion regarding who was "in charge" of the response. From the beginning, Lucas County acted as the coordinating body through its EOC. Officials from Trotter quickly went to the county EOC and coordinated their efforts at the same location.

Let us first discuss the activities of the two most centrally involved fire departments. The Municipal Airport Fire Department received word of the crash almost immediately through a "hot-line" from the airport tower. The airport fire trucks responded to the crash site by going down the runways/taxiways and through a gate in the fence site. They

were initially faced with limited visibility. Since they were responding from the rear of the crash, they initially saw the rental car building and parking lot engulfed in flames. Their shift officer in Truck #1 activated the mutual aid agreement which brought in additional equipment. Several of their units went to the west and their pumper went to the building. As they extinguished the flames, they moved further north into the wreckage. The main fire was suppressed quickly, within about five minutes. There were numerous small fires at the crash site which took about 20 to 30 minutes to extinguish.

Since there was almost no rescue activity--only one passenger survived--the department worked at search and body examination after they had suppressed the fires. This activity involved locating bodies and body parts and covering them with yellow blankets although they eventually ran out of body bags and blankets. The airport fire equipment began leaving the scene at 10:03 p.m. and all equipment had been removed by 10:30 p.m., less than two hours after the crash. By 11:30 p.m., all fire equipment was ready again for full response at the airport.

For the Trotter Fire Department, the first word of the crash came at 8:47 p.m. from a Trotter police officer. Fire stations #2 and #4 were activated using the tone system. Station #2 is just north of the crash site, and station #4 is just to the south. In going to the crash site, the Trotter Fire Department encountered a truck that had been hit, left some personnel to handle that situation and proceeded to the plane. At 8:56 p.m., the organization mobilized their other two stations and activated their mutual aid agreements. Some trucks that came as a result of the mutual aid agreements stood by in Trotter stations to cover fires in the city; others went to the rental car building. These fires were suppressed within 15 to 20 minutes.

The entire Trotter volunteer fire department responded. This force includes four stations with eight pieces of equipment and 43 fire fighters. In addition, 15 other fire departments responded. The disaster site was clogged. Although the fire fighting equipment that arrived early had no trouble with traffic, equipment arriving later could not get access to the area. It was estimated that 250 fire fighters were on the scene at the peak of the response.

After the plane fire was extinguished, the Fire Chief reported to the county EOC and his fire fighters and others formed 60 to 70 groups of three persons each that searched for bodies and body parts. They worked under the supervision of the county medical examiner. The first units left at 2:00 a.m., and all were gone by 3:15 a.m.

Both the Municipal Airport Department and the Trotter Fire Department attacked the fire site; the former from the south and the latter from the north. The two departments, however, could only communicate with each other face-to-face. Both departments fought the fires that were closest to them. The flames were extinguished quickly. Furthermore, although the plans of the airport fire department call for them to

respond to plane crashes within a five mile radius, they had never planned for an off site crash. The on site plan specifies that outside fire companies are to report to a staging area from which they would then be assigned. It is not clear, however, who is to be in charge of a crash outside of the airport fence. In this case, though, the independent and autonomous action of the two departments did not affect the speed and effectiveness of the response.

Three primary law enforcement agencies participated in the response. The Lucas County Sheriff's Office learned of the crash when the airport "hot-line" rang in the communications room located only one half mile from the crash site. The communications officer using the cascade system began notifying all officers in the department and requested as much assistance as possible from the mutual aid network. At the height of the event, 800 calls per hour were coming into the communications center which was operated by three officers. The Trotter and the State Police were notified. Officers began to arrive at the scene, and three sergeants began the coordination of the 40 officers who were already at the site. The Sheriff's officers worked for the fire department until the disaster site was secured. An outside and an inside perimeter was established.

Initially, there was confusion at the site regarding the role of outside law enforcement officers. Communications were difficult because of the use of different radio frequencies and no one really knew who was present at the scene. Many police officers simply "came in on their own," and there were a number of spectators. A Senior Inspector of the Sheriff's department went from the EOC to the site immediately. By 10:00 p.m., he had returned to the EOC and pulled back all command officers, set up new perimeters, and redeployed personnel. The decision was eventually reached that the Lucas County Sheriff would be in charge of the inner perimeter, Trotter police would handle the outer perimeter, and the State Police would be in charge of the interstate area. Considerable autonomy was left to the on site commanders.

Part of the mutual aid system planning involves mobilizing Sheriff's officers from the jail. Most of the 900 Sheriff's officers work in the jail. The county locked the jail and brought all available officers to the scene. The partial intent was to use members for ID teams to locate bodies at the site. The Sheriff's officers were also involved with damage assessment, security and inspection. The county also brought a force of 75 to 80 Civil Air Patrol personnel to the site. Most of these individuals were teenagers and were used for runway inspection.

It turned out that the county requested more assistance than it needed. Officers from the jail were in sitting in busses, but after consideration it was decided that they would be unable to help in one matter because they were not "seasoned" enough to face the task of searching for bodies and body parts. DRC was given similar comments about the young Civil Air Patrol members who had been brought to the airport. Finally, although communication within the department went

rather smoothly, there was a great deal of difficulty communicating between officers from different departments.

The Trotter Police Department initially learned of the crash when one of their cars turning onto Brown Road saw the explosion. Their dispatch office was immediately notified. Supervisors and command officers were called. The five patrol cars on the road all responded. The dispatcher automatically implemented the mutual aid agreement and sent teletypes to other departments to send ten percent of their forces to the airport area.

Initially, it was difficult to get good information from the crash scene. Officers were working at the scene and radio traffic was cluttered. The mayor and coordinator of emergency planning arrived and began to set up a makeshift operations center at the police headquarters. It soon became clear that this EOC would not work and the officials moved to the county EOC.

Trotter police quickly met with the Lucas County Sheriff and attempted to coordinate their response efforts. People were getting into the airport from the neighborhoods, the crash site was not secure, and access routes were clogged. Officers started coming to the Trotter police station and were asked to seal off access routes and to open up a few access routes. Eventually, it was determined that Trotter would handle traffic control and the outer perimeter, and that Lucas County would clear the area around the crash site and institute immediate perimeter control.

At about this point, the department lost "administrative control" of their officers, but officials believed that the necessary tasks were being accomplished. Once area control was established, the command officers went into the field. They found that roads were being closed that were not essential to controlling the accident scene, but that were leading to massive traffic jams. These roads were opened and the perimeter was moved closer to the crash site. Within two hours, three other roads were closed to all but emergency traffic. Officers were assigned eight hour shifts during the initial emergency period, but many had already served five to six hours of normal pre-crash duty. Eventually, departments that had moved into the community as a result of the activation of the mutual aid plan were assigned to a specific location and rotated their own personnel. It took two to three hours to achieve this coordination.

Other complications in the response should be noted. First, the coordination between Trotter and Lucas County organizations was minimal. Although one governmental entity took over outer perimeter control and the other managed the inner perimeter, they each activated their own mutual aid plans. Trotter found a time when it had too many officers available than it could use, while Lucas County was requesting more. Second, although Trotter has an emergency plan, it is not well known, rehearsed, or integrated with that of Lucas County. Initially, Trotter attempted to initiate their disaster plan by establishing an EOC

at the police station. The specifics of this plan was not known by the line officers of the police department, which made implementation difficult. At times, contradictory orders were received from city officials and police officials. Eventually, the city EOC was moved to the county EOC to aid coordination. Third, a history of county jurisdictional problems also worked against coordination. The Trotter Police Department is only six years old. Prior to that time Lucas County supplied police services to all cities in the county. With the establishment of individual police forces, there has been less coordination. This situation is illustrated by the Mutual Aid Police Frequency. The mutual aid plan specifies that the requesting agency handles the MAP frequency to dispatch incoming mutual aid officers to their location. Local police departments, however, need to wait for the MAP radio to arrive, which, in this case, would have taken about 15 minutes. However, the county, which has its own radio, was already on the frequency. So Trotter handled the assignment of their mutual aid organizations through the county dispatcher. Fourth, the Trotter communication center also had some problems. It has two radio stations with two frequencies, ten incoming phone lines, two telephones, and three officers to handle the police, fire and phone calls. The system was badly overloaded in the plane disaster situation.

The State Police learned of the crash from a scanner. The Second District responded and assumed responsibility for the interstate highway, which they closed for a distance of six to eight miles. They initially used 48 officers and three to six commanders on 12 to 15 hour shifts. They were able to rotate their own personnel using available resources. Also, they dispatched a radio to the county EOC and coordinated their work with the Lucas and Trotter departments.

Before systematically discussing the problems inherent in this multi-organizational response, it is important to note the positive elements of what was accomplished. Organizations responded quickly, the fire was extinguished rapidly, the lone passenger that survived was rescued, body recovery and identification were handled well, resources were obtained quickly, and mental health care was provided to many families and site workers. Part of this positive response was the result of situational contingencies that proved fortuitous. The crash site was next to the airport and the county EOC. The crash occurred on a roadway during a "slow" traffic period. Also, there was only one survivor that had to be handled. A number of our informants indicated that if the crash had been in a residential neighborhood, during "rush hour", or if there had been many survivors, the resulting scenario would have been vastly different than what had actually happened.

There was considerable disagreement about who should have been "legally in charge" of the disaster response. Some officials thought that the airport and county had the responsibility of responding within a five mile radius of the airport; others felt that they were limited to the airport perimeter. Since there was only one survivor and the fire was quickly extinguished, this lack of understanding about responsibility did not create a problem. However, given that there are two

jurisdictions closely linked with the airport, and given that they both have disaster directors and plans, there obviously has been a lack of prior planning and coordination. A future more serious airport disaster that occurred in a jurisdictionally ambiguous zone could create very serious problems in the overall organizational response.

Furthermore, the decisions to implement the mutual aid agreements and to request additional personnel were immediately carried out by communication officers who had little authority or knowledge of the exact scope of the disaster. As a result, more people responded than were needed. The plans to coordinate these officers as they arrived on the scene were inadequate. A consequence was the collective presence of many fire and law enforcement officers, but with no official anywhere really knowing who they were, where they were present, or what they were doing. Also, it was decided after they had been brought to the airport that personnel from the jail and the youths from the Civil Air Patrol should not be used for the recovery of mangled bodies and their identification.

Communication also presented some difficulties. While each of the jurisdictions could communicate internally, organizational personnel from the various communities were not able to communicate easily with one another. Although the MAP emergency radio frequency was readily available, disagreement over who was to implement its activation resulted in Lucas County controlling it with their own radio, which forced Trotter groups to route their communications through the county communication center.

Also, prior drills had only involved scenarios for crashes on airport property. Surrounding communities in the main had not been involved in the exercises. It seems that the Trotter police department had never participated in a drill involving the airport. In turn, the Municipal Airport Fire Department had never participated in any off site drill.

Overall, the response was effective in that needed tasks were accomplished. However, the disaster along certain lines presented few demands; there was only one survivor from the plane and seven injured on the ground, which put very little pressure on rescue and health care facilities. It was a very focused, concentrated event which resulted in hundreds of disaster workers all functioning within sight of one another.

The organized response was massive but more than was necessary. One informant reported that "there was more, far more, resources there than were needed. It was confusing, but the job was getting done." Approximately 700 fire and police personnel were estimated to have been at the scene. Personnel from about 50 police departments and 20

fire departments responded to the crash site. This massive convergence according to most officials was not only unneeded but created unnecessary problems..

While the response was massive, it was also carried out initially without a great deal of overall coordination. There was much independent organizational action. The Municipal Airport Fire Department controlled their own early activities, while the Trotter department coordinated theirs. The Lucas County Sheriff's officers were controlled by three sergeants at the scene. Trotter police were coordinating via radio their own personnel from their own station. As noted, for a while there were four separate command posts on the scene. Relatively soon overall coordination was partly brought about by the county EOC. However, even after this coordinative effort, the inner and outer perimeter control by the county and city units continued to be handled independently.

Nevertheless, prior planning and preparation did have some important input into such effectiveness as there was in the organized response. Lucas county has a nuclear power plant emergency plan which provides many of the basic elements necessary for any emergency response, such as the bringing together of resources and decision makers at the EOC. In addition, the community had earlier developed a plan for handling the visit of the Pope. This planning had resulted in close working relationships between certain agency representatives, as well as the development of plans to block access to certain places around the airport vicinity. Furthermore, a smaller plane crash earlier in the previous year and a crash drill improved the speed and coordination of the response effort.

In sum, while certain intraorganizational problems were experienced by some of the responding agencies, such as the communication overload on the Trotter Police Department, most of the difficulties encountered in this effort were of an interorganizational nature. It must be emphasized that the response was laudatory in many respects. Yet the event was plagued by a number of problems and less favorable situational contingencies would have presented far more demands in the organizational response.

Case Study #6: A Fire and Toxic Spill in Richdon

Richdon is a city of about 500,000 residents centered in a larger metropolitan area of about 2,000,000. Its police and fire departments are part of a traditional Public Safety Office; both units are large and have extensive resources. The police department has 1,100 officers to enforce law and order in the approximately 55 square mile jurisdiction. The fire department employs 928 persons and is divided into six battalions who man 36 stations. Both of these units are part of the Department of Public Safety, which also oversees the operation of the EMS unit and the HAZMAT team. Therefore, structurally, the police and fire organizations are inherently interrelated during

normal operations and are both responsible to the same official position, i.e., the Director of Public Safety.

At noon on a spring Saturday, two freight trains were passing on adjacent tracks in the western part of town. The tracks were bordered by a "bus way" that was controlled by the Richdon Transit Authority. The trains, moving in opposite directions, collided. The collision resulted in a fire and the spillage of various materials, including toxic chemicals. Two Transit Authority bus drivers on the adjacent "bus way" observed the accident and notified the Transit Authority over their two-way radios. The Transit Authority then immediately contacted the Richdon fire department.

Meanwhile, the Richdon fire department simultaneously was learning of the event from one of its stations near the accident. Within four minutes the first fire unit responded to the scene. The first responders attempted to determine the nature of the fire and the chemicals by obtaining the railroad manifest and the hazard identifying placards from the train cars. Meanwhile, personnel from other units, including the Richdon police department, the Transit Authority, the local EMS system, and the Fire Prevention section of the fire department arrived. A field command post was established and the Public Safety Director assumed command of the event.

However, no immediate determination could be made about the toxicity of the chemicals. Therefore, under the direction of the Director of Public Safety, at approximately 1:00 p.m., it was determined that an evacuation should take place. Personnel from the Fire Prevention Unit, the police department, and the Transit Authority were involved in the operation. Members of the police department used their sirens and bullhorns to advise local residents of the evacuation. EMS personnel were sent into the neighbor to aid invalids. Because of wind shifts, it proved necessary to keep expanding the designated evacuation areas. Onlookers also had gathered at the scene and they had to be dispersed.

The contents of the train car finally were determined to be toxic some time between 3:00 p.m. and 4:00 p.m. At that point, the HAZMAT team, composed of members of the fire department and EMS, took action to "knock down" the fire and stop the hazardous leak. These actions were accomplished within minutes.

Sometime later a decision was made that the tanker car should be drained and placed upright, but it was determined that it would be best to wait until the next day, a Sunday, to take this action. Therefore, the evacuated local residents were allowed to return to their homes. The plan was to evacuate them again when the car was stabilized the next day. Several organizational personnel remained at the site, but the major decision making officials from the Department of Public Safety returned to the Public Safety building to plan the next day's evacuation. Within a few hours, plans were developed for

the Sunday evacuation. Approximately 60,000 persons lived in the area to be evacuated.

However, few hours later at approximately 10:00 p.m. a call was received from the on site personnel reporting that the leak had begun again and that the evacuation should begin immediately--not the next day. The recently completed evacuation plan for Sunday was thus operationalized 12 hours earlier than anticipated. Although those moved were far more numerous than those involved in the first unplanned evacuation earlier that day, this later evacuation included only approximately 16,000 people, not the 60,000 originally envisioned. The same organizations took part in the operation as had been originally planned.

After the evacuation had been completed, the leak was again plugged by the HAZMAT team. Later on Sunday, a nickel plated tanker was obtained to transport the chemical from the overturned tanker car away from the site, and the car was righted. The spilled chemical was sprayed with water to create a "controlled cloud". The remaining toxic and non-toxic debris were buried underground or transported by a private contractor to a dumping site. Other debris was removed from the tracks and surrounding area. Between 4:00 p.m. and 5:00 p.m. the evacuated residents were allowed to return to their homes.

The train accident occurred when the Richdon police Zone Commander for the affected area was off duty. Upon hearing of the event, he contacted the Assistant Chief of the fire department and went to the scene, where a command post was established. As Zone Commander, he assumed responsibility for evacuation on the eastern side of the spill. Within minutes, other units of the police department also arrived at the site.

The police department limited its activities to two primary tasks: site security and evacuation of the surrounding areas. Site security presented few problems, in part because the area was isolated. Evacuation, however, presented more problems. Elderly residents with medical problems and a few stragglers who were reluctant to leave the area created logistical difficulties. The EMS unit helped with the former, while the latter were somewhat tolerated, since while evacuation was strongly recommended it was a voluntary action. Nevertheless, most persons agreed to leave once the evacuating officers had explained the danger to them.

Because of the timing of the accident, there were no problems with work shift changes or a shortage of personnel. The day shift, however, was held on duty as an augmentation to the on coming evening shift. Also, due to the large size and resources of the department, the police never experienced organizational stress. They were able to handle all of the other calls that came into the department while they responded to the toxic spill.

Similarly the fire department limited its activities to two primary tasks: fire suppression and evacuation. With regard to the fire fighting activities, the event did not present any major problems. As one informant noted, "this was not a big fire." After determining the nature of the chemicals, the department easily suppressed the fire. No additional fire fighters were called to the scene. As to the two evacuations, the fire department sent personnel, including members of the fire prevention unit, into the surrounding neighborhoods to notify residents of the intended courses of action. Both the early unplanned evacuation and the larger, later, planned one were coordinated by the Assistant Chief of the fire department. During the initial evacuation, the Assistant Chief evaluated the direction of the potential toxic fumes and indicated which areas should be evacuated first. The second evacuation followed a rapidly developed plan to evacuate specific areas.

In addition to the police and fire departments, a few other local organizations were heavily involved in disaster operations. As noted, the Director of Public Safety participated in numerous response activities. He served as a governmental representative to the mass media and was instrumental in both evacuation decisions. The EMS and HAZMAT units also played significant roles. Although there were only a few "minor injuries," EMS assisted in the evacuation of the elderly and disabled. The HAZMAT team, most of whose members are also a part of the EMS system, had primary responsibility for determining the nature of the dangerous material and stopping the leak. Following the initial response, the Chief of HAZMAT also supervised the clean up and pumping out of the material.

The Transit Authority also contributed to the response. The Transit Authority police secured the initial right of ways around the incident and then assisted the Richdon police in traffic control. The safety division loaned their services and their high capacity air tanks to the HAZMAT team, which lacked this equipment. The Authority also provided heavy duty equipment for the clean up and 107 buses for the evacuation; these buses were also used to transport the evacuated residents back to their homes.

Along many lines, this was a rather fine response. No deaths occurred and there were very few injuries. Two evacuations were completed successfully in a very short period of time. Interorganizational relationships within the Public Safety division appeared to be relatively smooth. A potentially dangerous, if not "disastrous," situation was managed and remained at the "emergency" level. No major problems or severe stress were faced by the responding agencies.

Why was the response so good in nature? A number of factors can be indicated. First, the event was not of a magnitude that exceeded the ability of the emergency response units. We have previously noted that the Richdon police and fire departments are large organizations with extensive resources and personnel. The accident was highly

focused and limited in its geographic impact. The existing resources were very adequate to deal with this limited, focused incident.

Second, the response may have been facilitated by the traditional structure of the Department of Public Safety. While normal cleavages and antagonisms between police and fire departments can be found even in Public Safety arrangements, the structure does tend to integrate and coordinate their activities on a normal day-to-day basis that can have positive effects at the time of disaster. Placing all emergency response agencies within one department can stimulate interaction among the units, increase their familiarity and knowledge of each other and their activities, and reduce the likelihood that serious jurisdictional or domain problems will occur at times of emergencies or disasters. It was not happenstance in this event that the first person the police zone commander contacted after hearing of the event was the Assistant Chief of the fire department.

Third, Richdon was fortunate with respect to the social timing and place of the event. The debris from the accident fell onto the bus way, which allowed for easy access to the site. Also, the incident occurred on a weekend when the bus way was not crowded. In addition, on the weekend, family units are together, individuals are not involved in school and business activities, and any evacuation process is thus facilitated. Finally, it did not rain. The toxic chemical involved reacts with water and a very serious cloud could have formed.

Does this assessment indicate that there were no problems in this response? No. There were a number of difficulties. Although most of them were relatively minor, they could have been increasingly severe if an event of larger magnitude had occurred or if some of the previously mentioned situational contingencies had not been present.

First, there were some evident problems of logistics and resource acquisition. The police on scene were located "down wind" from the site. They did not have the proper equipment necessary, particularly protective masks. The HAZMAT team members were put into their "moon suits" too far from the scene of the event. Therefore, they were forced to remove the suits, store them and begin the process again. A number of our informants said that the incident command post was located too close to the accident and posed a potential danger to the command personnel located there. Furthermore, it took a considerable period of time to determine the nature of the toxic material. Also, it was difficult to secure the proper type of transportation for the toxic materials involved. Only after two false starts, was the proper type of tanker was obtained.

Second, there were problems of communication. Some of these were internal to the responding organizations. There were "dead spots" in the radio system and an inability of organizational officials on different channels to communicate with each other. Other communication problems involved the evacuation messages that were being given to citizens. Some informants reported that incorrect evacuation route

information, or no information at all about routes, was given by police officers who were cruising the areas. Also, those involved in the evacuation were told to issue specific directives regarding the availability of buses. These were not always given.

Third, commanding officers, and those in an overall coordinating function, were heavily involved at the scene itself. As one informant noted, the top officials "wanted to fight the fire themselves." Because of their actual response activities at the scene, some of these individuals were difficult, at times, to locate and access. This condition points to the need, as noted in much disaster research that there is a difference between "emergency management" and "emergency response." If those in management positions become overly involved in actual operational activities during disasters, this can result in less than an efficient organizational response. While not a serious matter in this situation, enough surfaced to indicate the nature of the problem.

Fourth, members of the response groups had no work relief. If the event had gone on for a longer period of time, fatigue would have become a factor. Though it did not, a similar event of just only longer duration would have created organizational problems in responding.

Fifth, although the Transit Authority was involved in the incident, it had not been involved in predisaster planning or exercises with the departments within the Public Safety Department. Furthermore, it was not involved and integrated even into the after action analysis of the event. In that sense, the event was not as much of an organizational learning experience as it could have been.

Finally, there was a degree of ad hoc quality in the organizational response. There was disagreement among a number of informants regarding the existence of a disaster plan. Some believed that such a plan exists; others stated that it was being "developed." In either case, it was obviously not a salient element of the response to this event.

Overall, however, the organizational response was well handled. It indicates the inherent advantage of large scale and vast resources in managing emergencies that do not severely stress local emergency organizations. It may also point to the positive effects of a Public Safety arrangement for interorganizational coordination..

Case Study #7: Planes Crash Over Norwood

Norwood is a rapidly growing community of over 50,000 nestled in the corner of Humber County, a major metropolitan area with millions of residents. Although Norwood is a relatively affluent suburban community, it relies upon Humber County to provide fire and police services to its citizens. This contract arrangement allows Norwood access to two of the largest and most resource rich fire and police operations in the county.

The Humber County Fire Department has approximately 2,800 personnel, including over 70 Chiefs, 500 Captains, 550 Paramedics, 600 Fire Specialists, and 1,000 Firefighters. Among its resources, it counts approximately 150 engine companies, 50 fire trucks, 40 rescue squads, and numerous other pieces of equipment. It firmly subscribes to the Incident Command System.

The Humber County Sheriff Department also provides services to Norwood. This department has a massive force of over 6,500 personnel, including 32 high command officers, 56 Captains, 272 Lieutenants, 854 Sergeants, and over 5,100 Deputy Sheriffs. Its equipment and resources are also extensive.

About noon on a late summer day, a small aircraft, apparently unwittingly, entered restricted airspace surrounding the Humber County Airport. The aircraft continued through the restricted area on a course that placed it in the path of an arriving passenger jet. The two planes crashed in mid-air and fell to the ground in Norwood.

The commercial jet slammed into a residential area of Norwood; the small private plane fell into a schoolyard. All 64 people on board the jet and the three passengers in the small plane died. On the ground, 16 structural fires were started, with ten homes being totally destroyed by fire and plane debris and six experiencing partial damage. A total of 15 residents were killed on the ground.

At the time of the collision, Company 44 of the Humber Fire Department was on a nearby training run. Members of the company noticed a large cloud of smoke rising from a residential area, but they did not know the reason. They did realize, however, that a response was necessary. They contacted the central dispatch unit of the department and informed them what they were seeing. Meanwhile, and at the same time, central dispatch was receiving numerous calls about the crash from private citizens. As the company proceeded to the site, it was apparent that the magnitude of the event could not be handled by one company alone; therefore, second and third alarms were placed almost immediately. Within less than 15 minutes, 15 engines had converged on the scene, plus numerous other fire units.

At about the time of the crash, two shift supervisors (sergeants) for the Humber County Sheriff Department were on their normal patrol duty. One noticed smoke billowing in a residential area. As he proceeded to the scene, word came via radio that a fire was burning and that an aircraft might be involved. The supervisor notified the other shift supervisor to advance to a specified location near the site. As the two arrived at the outer edges of the crash site, they established a temporary command post, which consisted of their two squad cars.

The above sets of actions began the response of both the Humber County Fire and Sheriff Departments. We discuss, in more detail, the response of each agency, beginning with the fire department. It is

important to remember two characteristics of this event: 1) the size and resources of the responding organizations (massive), and 2) the characteristics of the event (highly focused, localized, traumatic in nature but with few injured victims).

The first responding fire company was unable to get their vehicle very close to the actual crash site because of the number of fires and the debris that littered the area. However, they moved as close as possible and began assessing the fire suppression needs. The first estimates were that about ten houses were burning. Parts of the aircraft, bodies, and numerous body parts were strewn throughout the neighborhood. The place in which the company parked its vehicle became the Command Post for the remainder of the fire department's response. Utilizing the Incident Command System, the captain in charge of the first arriving company established himself as Incident Commander at this time.

It was determined (through visual observation) that there were no survivors of the initial impact. Thus, members of the initial arriving companies did not engage in search and rescue activity, but immediately began fire suppression. (This observation, however, does not indicate that they ceased looking for possible survivors. They would suppress the fire and at the same time do visual searches.)

About five minutes after the first company reached the scene, other companies began to arrive at the site. At about this time, a Battalion Commander also arrived and assumed the position of Incident Commander and the captain became the Operations Chief. An Assistant Chief then arrived and took on the Incident Commander role, and the Battalion Chief became the Operations Chief. This Assistant Chief was subsequently relieved by another Assistant Chief, who in turn was also succeeded by a third Assistant Chief. Meanwhile, more fire companies were coming to the crash site. They were assigned to a predetermined staging area. From that location they were directed to various places as ordered by the Incident Commander.

In addition to the Humber County Fire Department, fire units from neighboring communities also arrived. This response was occasioned by the "auto-aid" agreements that the county fire department has with other nearby cities and neighboring counties. "Auto-aid" involves a replacement function in which the assistance of outside units is automatic. "Mutual aid" also played a role, in which assistance is assured by prior arrangements. The convergence of equipment and personnel was massive. The Humber County Fire Department deployed 14 engine companies, five truck companies, five squads, two helicopters, two foam units, three HAZMAT units, a number of air supply and medical supply trucks, and many transportation vehicles for the command staff. A total of more than 200 personnel responded from the county department alone. In addition, a neighboring county dispatched five fire engines, a truck company, and a paramedic van. Another local department, through normal "auto-aid" arrangements for a two-alarm response, sent two fire engine companies and a truck company. A total of 29

ambulances also arrived and were assigned (by the Sheriff department) to a waiting area to transport potential survivors. Several paramedic units were also present, although there were very few injured and only five persons were transported. Some informants estimated the total number of equipment at the scene to be in excess of 140 units.

The Humber County Fire Department's initial concern was fire suppression. The perimeter of the fire scene was stabilized so that the fire could not spread. The area was sectorized into two divisions under the command of two Battalion Chiefs. A staging area was established, and a "strike team," composed of four engines, one truck and a Battalion Chief, was formed to relieve those fighting the fire. The fire suppression activities went well. Within one hour the fires were under control. However, the fire units remained on the scene for seven or eight additional hours to insure that no reignition took place.

However, the fire fighters did depart from their normal fire fighting procedures. Normally, they turn over materials to insure that no hot spots exist. In this situation, they simply poured large amounts of water on the places that had burned. This tactic was taken because it was the understanding of fire personnel that nothing should be moved in a plane crash and that the "integrity" of the scene had to be upheld. They thought that the National Transportation Safety Board (NTSB) and the Federal Aviation Agency (FAA) did not want anything moved. Some fire personnel apparently had received training from the NTSB on how to handle plane disasters.

The firefighters from the county department were not involved in any active searching for victims; their highest priority was given only to fire suppression. Nevertheless, as they were going through the rubble, any bodies or body parts they located were covered with yellow blankets and left at the point at which they were found. The actual search for victims was done by the county Coroner's Office, assisted in the task by a neighboring county coroner's office and the county sheriff.

Throughout the response there was a concern about psychological stress and trauma upon the firefighters. There was the feeling that working with dismembered bodies and traumatic conditions could produce stress and psychological problems. Approximately two to three hours after the plane crash, a "strike team" was brought in to relieve some of the firefighters; it was hoped that this relief might lower the stress level for the first responders. Also, prior to being released from the site, all firefighters were processed through a form of psychological debriefing. (This same pattern was followed for deputies of the sheriff's department).

The fire department was involved in activities related to the disaster for about three days. After the primary fire suppression work was completed, which was within a few hours, the department shifted to

such tasks as assisting in debris clearance and, initially, pumping swimming pools to locate any additional victims. Although one fire company was kept at the site for almost a week, within a few days the organization was uninvolved. All other calls for fire response that were made into the department in the hours after the crash were handled by the other forces that were not responding to the accident. Except for those directly involved in the incident, no additional personnel were requested and no shift changes were necessary.

Upon establishing the location of the command post, members of the Humber County Sheriff Department began to map the area of impact and to determine the perimeters of the zone to be cordoned. After several minutes, the initial cordon had been established. At this time, the on site commander (who at the moment was the first responding sergeant) moved the command post to a nearby utility company building. From this point, all of the security assignments were made. About 30 minutes after the department learned of the event, approximately 100 of its deputies were in the area. At nearly the same time, a lieutenant from the department arrived and assumed the position of on site commander. He remained in this position until relieved of duty at about 11:00 p.m.

The on site police commander, in conjunction with the shift supervisor, ordered a helicopter into the crash area. It was felt that this would assist in determining the exact places where the cordons should be set. It is important to note that the locations of the police and the fire command posts were separated spatially by several blocks, and that access from one to the other was hindered by plane wreckage and other debris. Thus it was necessary to travel about three miles to get from one command post to another.

Later in the day the on site commander moved the command post to the center of the impacted area. It was from this point that the on site commander continued police operations for the rest of the week. By the afternoon of the crash, both a primary and a secondary cordon area had been established. (The reason for the two cordons was to insure that no unauthorized persons got into the area--it was thought individuals might get through one cordon, but not two.)

Security (in the form of access to the area) was maintained by allowing only uniformed personnel into the site. If residents wanted to leave the area, they were allowed to do so. However, they were not permitted to return. This informal security pattern was replaced five days later by a formal pass system developed by the city of Norwood.

While organized response activity at the site of the crash continued, an emergency operation sub-command post was established at a nearby Sheriff Department sub station. The function of this sub-command post was to assist the on site command post in any manner possible.

Throughout the event, the Sheriff Department limited its activities to the tasks of security, cordoning the area, and providing assistance to the Office of the Coroner.

Other organizations were also involved in the response. As noted, the Humber County Coroner's office participated heavily in the search effort and handling of bodies. It was assisted by members of the Sheriff Department and by personnel from a neighboring county. They established a temporary morgue, but it was not utilized because the county's morgue facilities proved to be adequate and sufficient. The Red Cross opened a shelter in a local school, after first attempting to locate it in the utility building that was serving as the Sheriff's command post. Approximately 50 persons utilized the shelter. The City of Norwood was notified of the event within minutes and the Director of Safety opened its EOC within 30 minutes and staffed the center until later in the afternoon. But it was determined that good information about what was going on could not be obtained from that location given its distance from the crash site. Consequently, one person was left at the EOC and the remainder of the staff went directly to the disaster scene. For several days following the crash, the city emergency operations team (composed of the city safety director, city manager, and the mayor of Norwood) primarily acted to assist responders from the various converging organizations. They did not serve in the capacity of coordinator.

Overall, the plane crash was very well managed. The fire suppression activities were completed within a rather brief period of time. Only a very few people suffered minor injuries and they were transported and treated. The "integrity" of the area was maintained and a massive operation for handling the dead was successfully completed.

A number of factors account for this good response. First, the event, though disastrous to those directly involved, did not impose any great group stress on either the fire or sheriff departments and did not exceed their capabilities to respond. Although the response from both agencies was quite massive in absolute terms, relative to the size of the organizations, it did not necessitate use of all their resources. Both the fire and sheriff departments utilized less than 10 percent of their personnel and equipment in responding to the crash. So other concurrent normal calls for services were handled without any need to set a system of priorities. Second, the area has a history of planning for disasters and also of responding to major fires. The level of preparedness planning among both the fire and sheriff departments is quite high, and includes the utilization of the Incident Command System by the fire department.

Nevertheless, there were a number of problems in the organized response to the event. First, there were problems of communication. Within the fire department, their radio frequencies were jammed and there was a communication overload. Interorganizationally, there were also some difficulties in communication. There was little direct contact between the county fire and sheriff departments during the

first one to three hours. If contact was made, it was by foot and required the person making contact to walk or ride a considerable distance. This problem was alleviated when each department sent officers to the other command post with hand held radio units.

Second, some problems of coordination also surfaced. Each of the organizations involved in the response acted in an autonomous manner. The two major responding units, i.e., the fire and sheriff departments, maintained separate command posts. No one organization acted as overall coordinator for the entire response. During the initial fire suppression, the fire department worked independently of every other group and claimed to be in charge. After the fire was controlled, command of the area was given to the sheriff department. However, for the first critical hours there was limited contact among organizations and no one played the coordinative role.

Third, and perhaps related to the just noted difficulties, there were problems of convergence and congestion at the disaster site. Some of these difficulties resulted from the presence of spectators and others who converged on the scene. Firefighters reported that they had difficulty getting through the crowded streets into the crash site. Perhaps equally important, however, was the massive convergence of emergency equipment and personnel on the site. Literally hundreds of cars, engines, trucks, vans and ambulances were driven into the area. Traffic congestion was serious. In retrospect, it could be argued that much of this equipment, such as the ambulances, was not needed. This event represents a case of "overkill" in emergency response. There were also difficulties for the commanders in maintaining control over all of their equipment. In this specific disaster situation the results were not pernicious, but in other settings in which there are many injured persons who need to be quickly removed from the site, a similar kind of massive individual and group convergence could be highly dysfunctional for both the efficiency and effectiveness of the organized response. This happened, for example, in the Beverly Hills night club fire where as observed by a DRC field team the convergence was of such a scale that no vehicular movement was possible around the disaster site (see also Best, 1978).

Fourth, search and rescue activity was not systematically undertaken by the initially responding fire units. It was only systematized within a few hours after the crash by both the office of the Coroner and the sheriff. The firefighters were not derelict in their responsibility. Visually, they determined that there were no survivors at and around the crash site. As they fought the fire they remained sensitive to the remote possibility that there might be surviving victims. However, there is no evidence that there was any failure to save lives because of the way that the search activity were carried out. In this instance, the lack of systematic search and rescue was not a major problem; however, the potential for problems in this activity in other more demanding settings is obvious.

Finally, some of the problems previously noted may be inherent in the Incident Command System. The lack of coordination across units, the massive and perhaps over response, and the "bumping" of authority from one individual commander to another may be endemic to implementations of the Incident Command System. (We will consider these important issues in detail in our later analysis.)

In sum, this incident indicates the advantage of massive resources and planning in handling a disaster of limited scope and impact. There were no major problems with regard to resources or personnel. The key responding departments were able to engage in very limited traditional tasks. Intraorganizational difficulties were very minor because of the sheer resources available to the fire and sheriff departments. The only problems that did occur were of an interorganizational nature, and point to the difficulties that can emerge when organizations operate independently of one another.

Case Study #8: A Train Crash in Maxwell

Maxwell County is one of the major metropolitan areas in the United States. In addition to the City of Maxwell, the county includes hundreds of thousands of inhabitants in suburban localities. These county residents are served by two large fire and police departments. The Maxwell County Fire Department is one of the largest departments in the United States. It is a combined professional and volunteer force with over 1,000 career personnel, 3,000 volunteer firefighters, 32 volunteer companies, an emergency medical services division of over 1,000 professional and volunteer personnel, and a massive arsenal of resources, including over 70 engines. In a typical recent year, the fire department makes about 50,000 fire runs, with about 23,000 being actual fire incidents. In addition, its emergency medical services also have a yearly average of about 40,000 responses. The resources of the Maxwell County Police Department are also extensive. The department has over 3,300 officers who operate out of ten precincts.

Both of these departments have engaged in rather extensive disaster planning, although they have had limited experiences with disasters. In fact, a major disaster has not occurred in Maxwell for years. Yet both organizations have disaster plans that have been updated in recent years. Furthermore, the fire department is a firm advocate of the Incident Command System.

The situation changed abruptly on a quiet Sunday afternoon. In the small, residential neighborhood of Warren, the midday tranquility was broken by a thunderous crash. A passenger train and a freight locomotive, both moving in the same direction, were involved in a collision. For the next three days, the neighborhood was to become a center of confusion, injury, death and national attention.

The collision occurred at a point in the rail system where four sets of tracks merge into two. It is consequently necessary that trains traversing the rail system adhere to a strict traffic discipline. But

such a discipline was violated this day. The freight locomotive did not yield to the onrushing passenger train. The passenger train collided with the rear end of the three engine locomotive.

The impact made the cars of the passenger train to careen into one another; piling up and crushing the cars in front or below them. Travellers on the passenger train were thrown about and suffered varying degrees of injury. Passengers not seriously injured quickly began to exit the train and move away from the scene. At the same time, many residents of the neighborhoods on both sides of the track immediately came out to help victims of the crash.

At the time of the collision it was not known precisely how many passengers were on the train, but early estimates that reached responding organizations ran as high as 800. Eventually, it was determined that about 570 persons were on the train. Of these travellers, 198 were injured and 16 died in the crash.

The crash occurred at about 1:30 p.m. Within about one minute a call was received at the 911 Center from a citizen in the neighborhood of the crash site. The call was transferred to the fire department. A full first alarm response consisting of four engines, one ladder truck, and a battalion chief, plus a hazmat truck were dispatched. The Maxwell County Police Department was also notified. Three units arrived within three minutes. Thus began a massive emergency response by the county police and fire departments, aided by adjacent counties and state agencies. Literally, over one thousand police and fire personnel, with hundreds of pieces of equipment, were to converge on the scene.

Let us begin by discussing the response of the police department. The initial responding officers from the department arriving at the scene immediately became involved in removing victims from the wrecked train and the surrounding tracks. Within 15 minutes they requested a Phase I emergency response, which brought additional personnel and equipment to the scene. A Phase II response was requested about two hours later. Numerous police personnel quickly converged on the crash site. It is estimated that over 500 Maxwell County Police officers eventually participated in the response. In addition, approximately 100 officers from surrounding areas were involved through mutual aid understandings and about 180 state police also came to the site.

Command officers, including two majors and a captain, arrived at the scene within the first hour. One police major went to a nearby fire station that served as a staging area for the event. The other major established the field command post at the site in a local residence. A second command post was established on the opposite side of the railroad tracks adjacent to a temporary morgue. Both of these command posts were established about one hour and twenty minutes into the event.

The prime concerns at this time shifted from rescue to perimeter and traffic control, site security, and victim identification. Perimeter and traffic control presented serious problems. The site of the train wreck was concentrated in a very small area, and there were limited access roads into the neighborhood around the area. The massive response of police and fire equipment and citizens to the scene created problems of congestion. The state police assisted in control of the inner perimeter. Local police and outside personnel coming in on mutual aid agreements primarily handled the outer perimeter. It took approximately four hours to secure the site. Victim identification also posed serious problems. There was no readily available list of passengers. The Maxwell County Police Department called in the detective section to assist in identifying the victims. Additional officers arrived on the scene, including the Chief and other high ranking personnel.

With the arrival of another police major about two hours into the event, the disaster site actually had four separate posts from which operations were being directed. The recently arriving major took command of the command post, one major was designated as Commander of the Crash Scene, one major was Commander of the Staging Area, and another officer commanded the second command post on the other side of the railroad tracks.

At 5:00 p.m. the first strategy meeting was held in a private residence in the neighborhood. Representatives from the county police and fire departments, the state police, the NTSB, the railroad, the county government, the medical examiner, and the governor's office were in attendance. During this meeting the various tasks were divided among the responding agencies. The Maxwell County Police Department continued to undertake its previous tasks of perimeter and traffic control, site security, and victim identification. In addition, it provided assistance at the three shelters that had been established at the fire station that was serving as the staging area and two local elementary schools.

With the arrival of a borrowed van, the police department moved their command post at about 7:45 p.m. to the vehicle. Within about an hour, the day shift was relieved and sent to the staging area. However, it would be another four hours or so before they were cleared out to their assignments.

Over the next two days, the department maintained security around the area of impact. By the second day the outer perimeter cordon had been reduced. A complete list of persons killed or injured in the collision had been put together and contact was made with friends and relatives of the victims. The clean up activities had begun on the second day. Withdrawal from the site began in the morning hours of the third day and by about noon the police activities at the site were terminated.

Concurrent with the responses of the police were the actions of the fire department. The first arriving unit from the Maxwell County Fire Department was an engine company from a station that was only about two miles from the crash site. While this unit was part of a complete first alarm response, when it arrived at the scene of the disaster this company notified the county communications center and advised them that more equipment and manpower would be required. Within the next ten minutes, approximately 15 pieces of equipment were sent to the site. Members of the first arriving unit parked their engine partially across the narrow road and immediately began to assist victims of the crash. They also laid hose lines to extinguish the fires that had broken out as a result of the train wreck.

The fire department limited its activities to traditional primary tasks: fire suppression and search and rescue. There were no problems in carrying out fire suppression. In relative terms, the fires at the train wreck were of a minor nature and they were extinguished in a matter of minutes. Search and rescue, however, was a major task that consumed the efforts of the department for more than one day.

As noted earlier, the Maxwell County Fire Department is a disciple of the Incident Command System. The Captain of the arriving company established himself as the initial incident commander. His engine served as the initial command post. He was replaced by an arriving Battalion Chief, who was subsequently replaced as Incident Commander by a Deputy Chief. Furthermore, the Chief Deputy who had reached the scene served as a "roving incident commander." With the arrival of the higher ranking officers, a mobile command post was brought to the site. For a time there were two command posts operating which created some confusion for the county communication center; however, this problem was rectified rather quickly. In addition, a number of ranking officers went to the county communications center, where they dispatched personnel and equipment and handled requests for assistance.

Utilizing the Incident Command System, the train site was sectorized for search and rescue activity. From Sunday afternoon until the following evening fire personnel would be involved in searching for victims. The task was complicated because several cars had jammed into each other and it was very difficult to extricate the victims. Furthermore, the stainless steel railroad cars presented problems for the heavy duty rescue equipment that was being used by the fire department. Its equipment was strained, some of it broke, and additional equipment had to be obtained from an outside source.

A temporary morgue and on site triage area were established near the tracks. The fire department's emergency medical teams and state units operated the triage area. Over 50 ambulances came to the scene and at various times there were at least 10 helicopters in the area. A secondary treatment and triage center was set up at the fire station that was serving as a staging area. Over 175 persons required

hospital treatment and these were sent to about 10 local hospitals, with the nearest hospital receiving 40 of them.

The great majority of the injured passengers were rescued within the first few hours. In fact, most of them walked away from the train and were assisted in the first few minutes by neighborhood volunteers and arriving emergency personnel. By evening, practically all of the remaining victims had been extricated from the train wreck site. The last bodies were found at approximately mid-day of the second day. Fire department activity was terminated at the site at about 10:30 p.m. on the second day. However, a unit of about 20 to 25 fire officers was kept by the tracks until morning.

There were many positive elements in response to this transportation disaster. The actions of the individual police and firefighters were extensive and indicated a strong sense of community and professional service. The response of the various units was massive. The nearby local police and fire units along with the units brought in by mutual aid agreements as well as the state police, enabled the county of Maxwell to provide a substantial and effective response.

Certain activities were extremely well handled. First, due to the lack of a passenger list, the identification of victims was most difficult. But the police did an exceptional job in utilizing their detective and investigative units to compile a list of passengers, victims, and the deceased. Second, the fire department undertook quick and responsive fire suppression activities. The fires were very quickly extinguished. Third, the Community Relations program of the police department did a masterful job of surveying the neighboring residents of the crash site. They determined which of the neighbors had participated in the rescue activities, which residents had suffered property loss or destruction, and they attempted to meet the needs of these persons. Fourth, the triage process on scene was well managed. Fifth, although there were some problems of equipment failure and the integration of "official" search and rescue activity with the emergent, volunteer citizen effort that was underway, the search for victims, though arduous, was successful. Sixth, the police department produced a very detailed and introspective afteraction analysis of the event and their operations in it. As such, it was a good organizational learning experience.

As in the case of all disasters, some problems surfaced. The police had difficulties with convergence, traffic control and site security. As was noted, the crash site was highly focused and there were very limited access routes to the area. The massive response by hundreds of emergency, civilian, and volunteer vehicles created huge traffic jams. One of the first responding fire units inadvertently added to the problem by blocking egress from the site. A traffic gridlock ensued and hindered the rapid removal of victims from the site to hospitals. There were also some problems with the outer perimeter control. No pass system was established and many of the posts at the outer boundaries were staffed by non local organizational personnel

who had been given less than adequate instructions. For example, it was difficult for a van full of medical personnel to get through the roadblocks into the area, even though they had earlier contacted the police to let them know they were coming. Furthermore, site security was inconsistent. For instance, members of the media appeared to swarm over the crash site. Neither press representatives nor citizens were actually kept from the crash site. Even in a focalized disaster that encompassed a very limited spatial area, there were difficulties in cordoning and in preventing convergence. Part of these problems may have been the result of the initial responders, understandably, rushing to do search and rescue activity at the train wreck, with no one immediately beginning to establish site security.

The major intraorganizational problems for the police concerned matters of communication and coordination. The radio communication channels were jammed. Commanding officers were forced to use hand held units until a Major arrived in a squad car. Portable radios did not transmit well. The staging area was somewhat isolated from the crash scene and did not have adequate information at times about the condition at the site. There was only one telephone at the staging area and there were problems there also with radio transmission. Furthermore, two field command posts were established at the site on opposite sides of the railroad tracks. However telephones were available in only in one command post, and the only contact between the two posts was by radio and runners. There was also some overlap in command activities, as tasks were broadly separated into the various command posts, making it difficult for anyone to have an overall picture of the situation. Furthermore, although the event occurred just prior to a shift change, the relief and reallocation of officers at the disaster site posed some problems. Some officers were sent to the scene to relieve personnel who themselves were on the same work shifts.

Furthermore, a number of interorganizational problems emerged. Some of these involved police and fire department interaction. The police and fire departments established separate command posts. There was some disagreement between the agencies over who would utilize the mobile van. It was several hours into the event before the police department established a permanent mobile on site command post after they borrowed a van from an outside group. This delayed obtaining information directly from the scene. Also, in the very initial stages, police personnel engaged in search and rescue. According to plan, the fire department was to do this task, which they did soon replacing the police. These problems were mainly centered in the initial period of the response. As the event progressed, the relationship between the police and fire units became much more cooperative in the sense of the linking and integrating of their separate organizational activities.

However, there were other interorganizational difficulties with some of the units responding on the mutual aid basis. At one point, officers from another county left their posts when their commander

left the scene, without having received any directives from the Maxwell commanders.

There were other difficulties too in fire department operations. There was both feast and famine with respect to resources. On the one hand, the massive response of equipment actually helped create problems of congestion and convergence. In addition, equipment and personnel were being dispatched by a variety of commanders from different locations including the field command post and the central dispatching center. The county central dispatching center did not know the whereabouts of some of its equipment. It was being assigned by other officers in the field without the knowledge of the center. On the other hand, some specialized resources, such as heavy duty rescue equipment, broke or was in short supply and additional items had to be obtained elsewhere.

Although search and rescue was adequately handled, the initial first responders simply ran to the impact scene. They did not check to see if the downed wires they were crossing were still live. The already ongoing rescue effort by citizen volunteers from the neighborhood was never really integrated into the fire departments efforts. But once the impact area was sectorized, the search and rescue activity was well coordinated.

The fire personnel, just as had the police, had communication and coordination problems. The flow of messages on their radio channels was clogged and radio discipline was lost as there was massive often overlapping attempts at communication. While the original problem of two command posts was soon resolved, there then developed uncoordinated requests and orders from different points in the communication net. For example, fire officials at the EOC and at the fire dispatch room as well as the on site command post issued contradictory requests for equipment and resources; some were unnecessarily sent and contributed to convergence on the scene.

With regard to interorganizational difficulties, the early difficulties of the fire units with the police were soon resolved. The two departments, however, did tend to operate somewhat independently throughout the event. The relationship with outside mutual aid forces was generally positive but there was some confusion over the identity of outside officers and the rank of outside personnel.

That some organizational problems surfaced in this disaster simply means that this was in some ways a "typical" disaster, and not that there was anything unusual about the police and fire organizations involved. Overall, both departments generally met the demands in the disaster situation while at the same time they were handling the normal calls in the county. (although as is often the case in such situations there were very few fire calls during the emergency period.) However, the problems observed do indicate the difficulties that can arise from an "overkill" response. It can be argued that there were too many vehicles and personnel at the site, too many

command posts operating somewhat independently, and too little information distribution from the site to outside units. (The nearest hospital, for example, did not receive adequate information on the exact number of casualties it would be receiving.)

CHAPTER 5. RESEARCH FINDINGS

In chapters 2 and 3 we summarized what the existing research literature indicated was known of the planning for and response to community disasters by local police and fire departments. In chapter 4 we primarily described what DRC observed of such organizations in its just concluded field studies. In this chapter we present the more general research findings that we have drawn from the earlier presented descriptions and case studies.

Our interest is in answering two questions. First, do the previously reported patterns and problems still exist? Clearly here DRC is using its earlier studies as a base line against which we are comparing the present situation. In a gross sense, the observations might be similar or different. In either case, what accounts for what we recently have found?

The second question, while not independent of the first, has to do with the organizational consequences of certain internal and external changes that have occurred both in police and fire departments in the United States in the last 15 years. For example, in a little over a decade new factors have appeared that could affect the disaster related activities of local police and fire departments. These would include the development of the Incident Command System, the greater degree of community preparedness undertaken for hazardous chemical accidents, the increased involvement of police and fire in the provision of emergency medical services (EMS), the accelerated planning around nuclear plants, and the greater lead role by FEMA in training and educating for a multihazard local approach to disasters.

What differences do these make in the responses of police and fire departments?

We have already implied that there seems to have been more changes and consequences for fire than police groups. An effort will be made to highlight some of them in the rest of this chapter. We begin by discussing the structure, resource base and planning for disasters by both police and fire departments.

1. The Structure, Resource Base and Planning for Disasters.

POLICE DEPARTMENTS

American police departments as all organizations tend to change selectively over time. Thus, as DRC in its studies of the police during and right after the riots and civil disturbances of the early 1970s found that such events brought about a number of structural and functional changes in police departments. In general, there was a move towards greater professionalization, the adding of new sub-entities such as community relations groups, and the greater use of organizational planning (see, for example, Brooks, Dynes and Quarantelli, 1972; Kreps, 1973b; Kreps and Weller, 1973).

However, while the indicated social changes with respect to riot preparedness did occur, police departments have not markedly altered their structure, resource base and planning with respect to disasters. In fact, as a whole, police organizations continue to be quasi-military groups who perform with a 24 hour operation a traditional set of law enforcement tasks. They also persist in varying considerably in their size and complexity. As noted in Table 1, this variation in complexity and size appeared in our sample of eight case studies. The

departments in Carbon Hill, Astor, and Bunkus are relatively small organizations who combine such tasks as traffic and patrol into the uniformed force. But those in Solara Beach, Richdon, Norwood and Maxwell are megaforges of approximately 1,000 officers or more.

With regard to resources, even the smallest units continue to have resources that could be valuable at the time of disaster. Perhaps one area where significant improvement in resources can be seen is that of communication. The larger departments have adopted "enhanced 911" centers which they increasingly share with fire departments. Even smaller organizations, however, such as those in Astor, have adopted more refined communication systems. But in general, the existent resource base of police organizations for disasters have not been markedly increased over what had been previously noted.

The degree of disaster planning varies across the various police organizations and tends to be related to the size of the department. In general, smaller police groups do not engage in many internal planning activities, for disasters or for much of anything else. While certain disaster time roles and tasks of the police may be spelled out in broader community and county planing documents, the departments themselves have undertaken almost no disaster planning in their internal operations. But with the exception of Richdon, where planning was not of a high degree, the larger organizations did engage in rather extensive disaster planning. Both the Norwood and the Maxwell departments have elaborate planning documents some of whose features are exercised.

But an examination of such planning as exists supports two observations made in the previous research. First, there still continues to be a strong tendency for police departments to assume that their usual, everyday emergency response mode of operating, can be simply transferred to a disaster situation. This traditional way of looking at the situation is especially evident in smaller departments whose members will often state that "we handle emergencies every day". Larger police organizations tend to be somewhat more sensitive to the qualitative differences that separate everyday emergencies from major disasters and recognize somewhat the necessity for different planning for disasters.

Second, even there is disaster planning, it is almost always only intraorganizationally oriented and takes little into account that in disasters there will be the need to link and coordinate responses with that of other community organizations, and in many cases, particularly the local fire department. In not one of the communities we studied, did any such interorganizationally oriented disaster planning exist. Often the separate planning by police and fire groups made different assumptions and used different terminologies. Given that, it was not surprising in disaster responses, to see separate police and fire command posts being established and to observe that there was not much initial group interaction between the two types of organizations. The limited kind of intraorganizational disaster planning and almost non-existent interorganizational disaster planning we noted, is of course what had also been observed in the earlier studies.

Finally, as can also be observed in Table I, police departments vary significantly as to their previous experience with disasters. The majority of those in the communities DRC studied had rather limited if any at all involvement with disasters in the past two decades. Moreover, only in Norwood had there been rather extensive experience with a variety of disaster agents. There appeared to be a relationship between the degree of disaster planning undertaken and disaster experience, Maxwell being a notable exception to this. (In fact, we would hypothesize that some of the difficulties observed in the response in the Maxwell department, despite its extensive planning, may have been a result of its lack of prior disaster experience).

In sum, while some changes with respect to preparing for civil strife have occurred in police departments, and while their radio communication capability has improved, there has not been major organizational alterations for disasters. Such planning as exists is limited in several important ways. However, the degree of disaster planning does appear to be associated with both size and complexity as well as prior disaster experience.

Table 1: A Comparison of the Size and Complexity, Disaster Planning and Disaster Experience of the Police and Fire Departments in the Eight Communities

	Size and Complexity	Disaster Planning	Disaster Experience
Police Department			
Carbon Hill	Small	Limited	Limited
Astor	Small	Limited	Limited
Bunkus	Small	Limited	Limited
Solara Beach	Large	Moderate	Moderate
Trotter	Moderate	Moderate	Moderate
Richdon	Large	Limited	Limited
Norwood	Large	Extensive	Extensive
Maxwell	Large	Extensive	Limited
Fire Department			
Carbon Hill	Small (V)	Extensive	Limited
Astor	Small (V)	Limited	Limited
Bunkus	Small (P)	Limited	Limited
Solara Beach	Large (P)	Moderate	Moderate
Trotter	Small (V)	Moderate	Moderate
Richdon	Large (P)	Limited	Limited
Norwood	Large (P)	Extensive	Extensive
Maxwell	Large (C)	Extensive	Limited

(V) = Volunteer Firefighters

(P) = Professional Firefighters

(C) = Combined Professional and Volunteer Firefighters

FIRE DEPARTMENTS

From an organizational point of view and with respect to matters relating to disasters, fire departments have changed significantly and far more than police organizations in the last two decades. To be sure there is considerable continuity from the past. Thus, the basic structure and the primary task of fire groups have not changed that much from what we had observed two decades ago. Great variety with regard to both size and the mix of career or professional and volunteer

personnel in departments is still present. This variety is indicated in our study: three are purely volunteer organizations, four are staffed by professional firefighters, and one is a combination of the two. In addition, four are small departments (three of which are volunteer), while four are large and rely predominantly upon professional personnel. In addition to the continued existence of a variety of personnel in fire departments, they also still continue to be primarily oriented to the major task of suppressing fires.

Nevertheless, there are some important differences in the pre-disaster patterns of fire departments compared to what was observed in the previous studies. First, there is evidence of the previously noted trend that fire departments are increasingly becoming involved in tasks other than the traditional fire suppression activity. In particular, fire departments are increasingly providing paramedic and emergency medical services to their communities. Half of the departments in our sample include paramedic or EMT units within their normal operation, including the relatively small department in Bunkus.

Second, there has been a significant improvement in the level of planning by fire departments since the earlier studies. The previous research found that fire departments engaged in limited planning for disasters and tended to rely upon normal SOPs to guide their disaster response. While that pattern can still be observed in communities such as Astor and Bunkus, in most of the cities we studied there had been at least a moderate level of planning, and in Carbon Hill, Norwood, and Maxwell the planning efforts have been rather extensive. In the latter two large departments, the planning has been based upon the Incident

Command System. This degree of disaster planning is in marked contrast to what DRC found in its earlier studies.

However, the planning that has occurred in fire departments shares the same problem that we found for police groups, i.e., it is intraor-ganizationally oriented and does not interface well with the disaster plans of other organizations. Fire departments continue to be rather autonomous groups that are concerned with maintaining their domain and boundaries. Their interaction with other organizations tends to be limited in their daily activities, and this isolation carries over to their planning for other than everyday emergencies.

Finally, as was observed earlier studies, most of the fire departments have had very little experience with disasters or even large fires. The notable exception was Norwood, which had had extensive experience with large scale fire activity and some disasters in the past.

In sum, along certain lines fire departments have maintained their past patterns such as their primary focus on fire suppression and their mixed work force composition. They also continue to have little experience with major disasters. However, along other lines they have markedly changed, especially in extending their activities into matters of a non-fire nature and in instituting disaster planning. On balance, of course, fire organizations are generally more similar than they are different from what we observed two decades ago, but nonetheless they have, as far as the disaster area is concerned, changed far more than police departments and the changes have been significant ones.

2. Organizational Tasks During Disaster.

POLICE DEPARTMENTS

Previous DRC work had found that police departments tended to limit their disaster tasks to activities consistent with their normal, everyday operations. These four tasks are: 1) traffic and crowd control, 2) protection of life and property, 3) search and rescue and 4) warning and evacuation. Although police organizations may initially undertake other emergency time tasks that are not being done by other organizations, they will withdraw from these nontraditional activities as soon as others perform them.

The case study findings indicate that this observation is still valid. In all the instances we studied, the police limited their major activities to the four traditional areas. Only in the case of Maxwell did the department extend its activities into the areas of victim identification and community relations. (Of course, these tasks are also traditional for police organizations although not in a disaster context.)

Within the eight communities DRC studied, the police engaged in the following, primary activities:

Carbon Hill: traffic and crowd control, warning, and protection of life and property

Astor: traffic and crowd control, warning and evacuation

Bunkus: traffic and crowd control, protection of life and property, search and rescue

Solara Beach: traffic and crowd control

Trotter: traffic and crowd control, protection of life and property

Richdon: traffic and crowd control, warning and evacuation

Norwood: traffic and crowd control, protection of life and property

Maxwell: traffic and crowd control, protection of life and property, search and rescue, victim identification and community relations

How were these tasks handled in the different disasters? Prior research had pointed to a number of problems associated with the carrying out of such tasks. If these were observed again in our later studies, do they stem from certain conditions that were hypothesized as important in early research, and/or do they result from new factors?

(1) Traffic and Crowd Control

This activity was undertaken by the police department in all of the disasters, and in almost every case there were serious problems in the carrying out of the task. Areas would be cordoned as road blocks were established, perimeter controls were instituted, and attempts were made to control access to impacted sites. However, except possibly in Carbon Hill and Richdon, these efforts were often not very effective. Massive convergence of emergency and civilian vehicles created congestion and hindered emergency activities in Maxwell, Bunkus, Solara Beach, Norwood, and Trotter. Although the convergence problems were much less severe in Astor, the security of the area was breached by numerous individuals. In Richdon, the traffic and crowd control was effective but may have been facilitated by the situational contingencies of an isolated disaster site with limited emergency vehicle convergence. In Carbon Hill, almost the entire community had been evacuated, which lessened the problem of crowd and traffic control.

A number of factors appear to be associated with difficulties in traffic and crowd control. First, in several of the instances, there

was an "overkill" emergency response with literally hundreds of organizational vehicles and thousands of officers converging on a spatially focused site. The social control agencies were simply overwhelmed by the massive convergence of fellow emergency workers who could not be stopped as easily as would have been civilians.

Second, in certain cases it took many minutes, if not hours, for cordons to be established. These delays resulted from a number of factors, including police officers initially undertaking search and rescue activities and only later turning significant attention to traffic and crowd control. In addition, delays in setting up road blocks resulted from a lack of information about what specific areas needed to be cordoned and how the task responsibility should be divided among responding units.

Third, it is very difficult to cordon off totally a designated area. Unless the site involved is a very small geographic area and has few access routes, "keeping everyone out, except those who should be in here," is almost impossible. Civilian residents of a neighborhood usually know all the byways to get into their own area. There always tends to be a degree of ambiguity about how to handle uniformed but non-local emergency personnel, members of the press, and also other civilians who appear to have legitimate reasons for going past a roadblock, and sometime are very insistent on entering an area (even disaster field researchers have been known to easily penetrate roadblocks and cordons!). Sometime even when it is possible to block automobile traffic on roads, if walking down alleyways or across lawns is possible, convergers on the scene will do so.

The previous research also pointed to difficulties inherent in the establishment of pass systems and the types of interorganizational problems that are associated with them. In none of the disasters DRC recently studied, was a pass system used during the emergency time period, that is at the height of organizational activities. Only Norwood developed any kind of pass system, and it did so only three days after the air crash.

The absence of pass systems not only indicates a lack of preplanning for traffic and crowd control, but also sometime had unfortunate consequences for the overall organizational response. Access to impact areas was generally determined by individual officers using their own discretion. In a number of cases, no consistent instructions regarding access to the disaster site were given to those involved in perimeter control. (This was particularly a problem where outer perimeters were staffed by non-local units or non-police personnel.) One result was that relief medical and rescue workers were either denied access or were delayed in their arrival to a number of the disaster sites, and this strained relationships between different responding organizations. Also, many civilians were not always understanding of differential access to cordoned areas, particularly if they blocked off from their own homes or places of work.

Earlier research had found that there were frequent problems in the police handling of disaster traffic and crowd control. This problem just as consistently manifested itself in the more recent DRC studies and seems to be related to old rather than any new factors in disaster situations. It may be that police departments underestimate

the difficulty of transferring everyday procedures for the control of traffic and spectators to the massive convergence that occurs in major disasters. Partly also because the first police responders sometime get involved in seeming more important matters such as search and rescue, there is often a delay in instituting traffic control measures so that by the time steps are taken, they are too late to head off the problem. The matter can not be resolved by ad hoc actions, but only by careful prior planning.

(2) Protection of Life and Property

Activities aimed at the protection of life and property was undertaken by five of the police departments DRC studied. In general, this activity (at least the protection of property) was very well managed. This was particularly true for the site security that was established around the three major transportation accident sites in Maxwell, Norwood, and Trotter. Once cordons were established and the site secured, the police were able to protect property and to quickly and skillfully identify victims. The task was made easier by the highly focalized and limited geographical area involved in the plane and train disasters.

The same point is illustrated in reverse in Bunkus. The tornado destroyed a large section of the community and thus created a more diffuse impact area. This in combination with the fact that the police remained involved in search and rescue led to a considerable delay in their efforts to protect property. The example does suggest that the task may be considerably more difficult in diffuse as compared to

concentrated disasters, a finding that was reported in the earlier research.

However, it should be noted that looting was not a problem in any of the disaster areas. Stories about looting only circulated in Trotter and in Bunkus, and arrests and convictions only occurred in the latter city. The lack of looting as a serious problem for police in disasters of course is very consistent with what has been consistently reported in the research literature.

The protection of life and property is a traditional police activity. It is one that they could be expected to manage well. However, to the extent that a disaster impact is spatially spread out there may be more of a problem than our case studies indicated. Although there are fundamental differences between the two situations, studies including some by DRC have shown that it is very difficult if not impossible for the police in riots and civil disturbances to prevent looting when that behavior is very spatially spread out over a very large area (see Quarantelli and Dynes, 1970, 1974).

(3) Search and Rescue

Previous work had indicated that search and rescue activities (i.e., finding, extricating and/or transporting victims including the dead as well as the injured and noninjured) present a variety of problems for police departments. Some of these are intraorganizational such the coordination of officers working separately from one another, the difficulty of reassigning individual officers from search and rescue to other tasks, and the problems of communication with field personnel dispersed throughout an impact area. Also, there are

interorganizational problems especially in coordinating police activity in search and rescue with that of both other organizations and the emergent, citizen activity that typically emerges in disasters.

The police engaged in search and rescue activity at only two of the sites: Maxwell and Bunkus. In Maxwell, the initial responding officers proceeded to rescue the victims before doing anything else. They were soon replaced by fire department personnel. In Bunkus, there were serious problems with the search and rescue activities. Individual officers, responding mutual aid agencies, and citizen volunteers all worked independently of one another. It was difficult to contact police officers in the field. The two subsequent searches that occurred were more organized, but the very fact that three different search efforts were undertaken is an indication of good lack of overall coordination of the task in the first place.

Our more recent data concerning search and rescue by the police are very limited. However, there was little in what DRC observed to indicate that previously noted problems do not continue to be latently present.

(4) Warning and Evacuation

Previous DRC research indicated that police departments have difficulties in warning that stem from two primary problems: 1) their reluctance to share information with other organizations, and 2) the problem of gaining compliance with an evacuation order, i.e., the problem of "forced evacuation."

In this more recent research, only the police departments in Carbon Hill, Astor and Trotter engaged in any kind of warning and

evacuation activities. (Actually these were the only events that allowed for a warning period.) The previously noted problems did not surface in the three cases studied. An organizational reluctance to share information was not observed. The issue of a "forced evacuation" was not relevant because all the evacuations were voluntary and compliance with the evacuation recommendations was high in all communities.

However, there were a few difficulties, mostly involving the content of the warning message that police officers gave to citizens. In both Astor and Trotter some of the police gave general, vague, or incorrect information to residents as they spread word of the evacuation. In some cases, people were simply told to "leave the area," without being informed of where to go, the availability of bus transportation, or the possible length of their stay. But apart from such matters (which in other contexts could have had serious consequences for evacuees), police involvement in warning and evacuation activities were fairly successful and well managed.

Overall, the recent studies show that police departments generally still continue to limit their emergency time activities to traditional tasks, as DRC had earlier observed. But also as previously noted, the police still have serious problems in getting effective traffic and crowd control, and in organizing and coordinating search and rescue activities. There were less problematical aspects than in the past with respect to protection of life and property and of warning and evacuation.

FIRE DEPARTMENTS

As with the police department, previous DRC studies indicated that the fire department is reluctant to undertake tasks that are not part of their normal day-to-day activities or outside of their domain. As a result, their disaster tasks tend to be limited to the following: 1) fire suppression, 2) search and rescue, and 3) emergency medical treatment (for those departments with EMS services). While fire departments may become involved in other tasks, they tend to withdraw from them as soon as possible. Finally, it was noted that the fire organization is one of the first groups to withdraw from involvement in disaster activities and return to their normal mode of operation and structure. The pattern represents a classic case of an established (a Type I) organization limiting its activities to those elements within its domain.

The data from our eight case studies indicate that recent patterns of fire groups are similar to previously observed ones except that they have recently gotten involved in warning and evacuation activities. The fire departments in the eight disasters engaged in the following activities:

Carbon Hill:	fire suppression, warning and evacuation
Astor:	fire suppression, warning and evacuation
Bunkus:	fire suppression, search and rescue, ems
Solara Beach:	fire suppression, search and rescue
Trotter:	fire suppression, search and rescue
Richdon:	fire suppression, warning and evacuation

Norwood: fire suppression, search and rescue

Maxwell: fire suppression, search and rescue, ems

(1) Fire Suppression

In all of the disasters, the local fire department undertook fire suppression. In many cases, such as Maxwell, Richdon, Trotter, and Bunkus the fires fought were relatively minor. (The fire organization in Astor never faced an actual fire, but did undertake fire prevention actions so that the gasoline spill would not ignite.) In Carbon Hill the fire was of only moderate intensity even for the small department involved, while the 16 structural in Norwood presented no major problems for its huge department. Similarly, the fire in Solara Beach, though a major structural inferno, was extinguished without greatly stressing the organization.

Except in Bunkus, all the fire suppression activities were well managed and efficiently handled. The response time of the arriving units was very quick. Fires were extinguished within minutes in most instances, and within little over an hour in both Solara Beach and Norwood. Only in Carbon Hill and Richdon did suppression take longer. In both of these instances the firefighters were faced with toxic chemical fires. In both instances they had some initial difficulty in identifying the chemical involved. Once Richdon identified the substance, the fire was extinguished in minutes. In Carbon Hill the blaze took considerably longer, but was suppressed within four hours. The only unsuccessful instance of fire suppression occurred in Bunkus, where a house caught on fire and the responding company was unable to

reach the site because of debris and congestion in the impact zone. The house was destroyed.

That fire organizations are adept at fighting fires in disasters is no surprise. Their normal day-to-day operations have immediate applicability in such situations. None of the fires necessitate activating mutual aid arrangements or bringing in outside departments. They were all suppressed by the local department (or departments, in the case of Trotter) that was able to utilize its own personnel, control its activity, and utilize its traditional firefighting procedures. (The only instance where traditional firefighting procedures were altered was in Norwood, where material was not turned over because of a desire to maintain the "integrity" of the site for the NTSB.)

These recent observations are consistent with previous findings. Even the delay in fighting chemical fires because of difficulty in identifying the material substance had been noted in the earlier DRC studies of chemical disasters (see Quarantelli, 1984).

(2) Search and Rescue

Search and rescue activity was undertaken by five of the fire departments, and, as was observed for police departments, it presented major problems for three of them. The plane crashes in Trotter and Norwood created few search and rescue problems because there were very few survivors of the tragedies. In Trotter, the fire department mainly searched for body parts. In Norwood, the search was informal and involved only a visual inspection of buildings during fire suppression activities.

However, the fire departments in Maxwell, Bunkus and Solara Beach had serious search and rescue problems. In Maxwell, problems involved the breaking and subsequent lack of equipment for heavy rescue, the physical difficulty of extricating victims, and the lack of integration of the formal search activities with the massive, ongoing volunteer effort. In Bunkus, the problems were most severe, and centered around a lack of coordination and integration of the search effort. In Solara Beach, the fire department lacked certain necessary equipment and did not coordinate its activities with those of the other major search and rescue groups.

Unlike fire suppression, search and rescue in a disaster context is not a traditional task for fire organizations (the limited search and rescue that fire departments undertake when responding to everyday fires is of a qualitatively different nature than encountered in a major disaster as we witnessed in Solara Beach). Even in those departments that have developed plans to coordinate and sector the activity, problems can still emerge given the urgency, uncertainty, and inherent interorganizational nature of such an undertaking.

(3) Warning and Evacuation

Previous studies did not mention warning and evacuation as critical tasks for fire departments during disaster. This is somewhat surprising, given the resources of local fire organizations, except that two decades ago hazardous chemical emergencies and disasters were far less common. Today they are far more common.

This is illustrated by the fact that three of the departments we studied undertook warning and evacuation in incidents of toxic spills

or releases. In these cases, the issuance of warnings and the help given in the evacuations were well managed and effective. The fire departments were primarily responsible for planning and implementing the evacuations. A number of situationally specific contingencies, including timing, location, and meteorological conditions, did facilitate the evacuation, but nonetheless the situations were well handled.

In general, it appears fire departments have fewer problems in task accomplishment than do police organizations. Part of the reason for this success is that fire organizations generally limit their involvement to the traditional task of fire suppression. When they undertake more nontraditional tasks, such as search and rescue, they start to encounter additional difficulties. Also, in the situations we studied, with the exception of Carbon Hill and Bunkus, the disasters and demands did not overwhelm or stress the resources of the involved fire organizations.

Finally, the previous observation that fire department tended to return as quickly as possible to normal duties after being involved in disaster tasks was also observed in all the recent cases. In every instance the fire department was one of the first organizations, if not the first, to withdraw from disaster activities and return to their everyday operations.

3. Intraorganizational Adaptations During Disasters.

POLICE DEPARTMENTS

The previous literature indicated that police departments undergo changes in both their normal activities and structure in order to meet the demands of a disaster. We found that this observation was valid,

to varying degrees, for the police organizations we recently studied. In particular, where the demands of the disaster event are extensive, where the resources of the department are few, where planning is limited, and where experience with disaster is slight, alterations occur to a greater degree.

(1) Alterations in activities and practices

The five major alterations previously observed by DRC to exist in police departments during disasters include: assigning priority to demands, reallocating personnel internally, redeploying and recalling field personnel, adding extraorganizational personnel, and reducing and delaying normal tasks.

The issue of assigning priority to demands was obviously faced by all of the departments to some degree; this is a normal element of emergency management. The difficulties in handling prioritization were least severe in the two plane crash disasters. The large police forces involved faced few tasks, other than traffic and crowd control and perimeter security. As such, competing demands were few. At the other extreme, the problem of demand priority was most severe in Bunkus. First priority was given to search and rescue activity, but due to communication difficulties and the inability to coordinate that activity, traffic and crowd control was delayed. In general, the more severe the demands and the smaller the resources of the department, the greater the difficulty in demand prioritization.

For most of these departments, the problems associated with reallocating personnel internally were not severe. In the smaller departments, all available personnel were utilized in the field.

Larger departments, as in Norwood, did not find the event demanding enough to warrant any such usage of personnel. Previous work had indicated that some units, such as detective and juvenile divisions, are often underutilized during disasters. This pattern was observed in the more recent cases, but appeared to be warranted, given the magnitude of the events and the available resources. Furthermore, in Maxwell, there was excellent utilization of the criminal investigation unit in the identification of bodies. The only instance in which reallocation proved to be troublesome was in Trotter. Jail personnel and young civil air patrol members were seemingly brought to the scene to help in search and rescue. But the problems presented by the carnage at the site limited their employment in the activity.

However, the task of redeploying and recalling field personnel presented major problems in a number of the disasters. Previous DRC findings indicated that in focused disasters, due to communication difficulties and the unknown parameters of the event, a surplus of personnel may be redeployed in the field or recalled from off duty hours; this often results in an inefficient allocation of unneeded officers at the impact area. We observed this previously reported pattern again in many of the situations we studied.

The rapid mobilization of sufficient police personnel was not a problem in any of the disasters, with the possible exception of Astor. In fact, the problem was usually of the opposite nature, i.e., a surplus of work personnel. Convergence of officers and difficulties in providing for their relief and redeployment was observed in Maxwell,

Trotter and Bunkus. Convergence was also a problem in Norwood, though redeployment was well handled.

The problem was exacerbated by the difficulties in communication that were evident at a number of sites. (We will discuss the problems associated with communication in a later section of the report.) At this point let us simply note that when channels are overloaded or equipment fails, the coordinative problems of redeploying and recalling personnel are exacerbated. In general, those police departments with the greatest communication problems also had the most difficulty with the handling of organizational personnel.

With regard to adding extraorganizational personnel, previous research indicated that the police are reluctant to utilize volunteers in their disaster operation. Furthermore, although they may work with volunteers in initial search and rescue activity, the activities are not well integrated or coordinated. The more recent case study material supports these earlier made observations.

The only community in which volunteers were integrated into the operation of the police department was in Bunkus, and this use of volunteers is a clear indicator of the extreme degree of stress and excessive demands that were being made upon the small department in that situation. The larger police departments we studied did not suffer from a lack of full time, professional personnel. Furthermore, there was little integration of volunteer and professional search and rescue activity in Maxwell, Norwood, or Bunkus.

Finally, the issue of reducing and delaying normal tasks must be considered relative to the size of the departments. In the larger

organizations, there was no reduction in the provision of normal police services to the broader community because only a small part of the normal force was needed for disaster operations. For example, in Norwood only ten percent of the department was involved in disaster operations. However, in Carbon Hill and Bunkus all normal tasks were suspended during the emergency period. Nevertheless, we have no data that indicates that this suspension of normal policing resulted in any serious problems.

In sum, we continue to find the indicated alterations in activities and practices during disasters. However, it must be noted that they are not always detrimental or pernicious to the police department's disaster response. They are often necessary adaptations that must be made to respond to the event and, if well organized, they can indicate effective emergency management. Furthermore, the degree of alteration in these activities and practices appears to indicate the degree of stress that is placed upon the police organization. The communities in which the adaptations were more extreme were those which faced the most demanding disaster impacts and the largest number of demands, while simultaneously suffering problems of responding to them either because of their lack of planning, and/or resources, and/or experience.

(2) Alterations in Intraorganizational Structure

Previous findings from DRC indicated that, although the police undergo relatively few intraorganizational structural changes, alterations can be observed in three areas: 1) the authority structure, 2) the decision making process, and 3) communication channels.

The Authority Structure

It has been previously observed that the police alter their authority structure during the emergency period of disasters by moving to a more military model of operations. This involves the setting up of multiple command posts, the direct involvement in lower level departmental activities by high ranking officers, and the utilization of on-the-spot supervision of field officers by field commanders who sometime reorganize such personnel into functional units or teams. It was further hypothesized that this altered authority structure can create such problems as conflicting directives, a lack of coordination among units, and the awkwardness of an imposition of a nontraditional source of supervision over individual field officers.

Except in Carbon Hill which only had a total of eleven officers, we observed alterations in the authority structure in all the other disasters. In all cases, field command posts were established. High ranking officers assumed direct supervision over middle and lower level departmental activities. Multiple centers of formal control could be found at various EOCs, dispatching rooms, and field command posts. In some settings, such as those in Norwood, Maxwell, and Trotter these alterations were previously planned. In the other situations they were primarily emergent in nature.

This alteration in the authority structure presented varying degrees of problems for the police departments, ranging from the severe to the mundane. Perhaps the most severe problems occurred in Bunkus. In the absence of the Chief of Police, three ranking officers informally shared varying degrees of authority and operated from three separate

locations, i.e., two field command posts and the dispatch room. In addition, the Mayor soon assumed control of all operations and also became involved in "directing the police operation" from a nascent EOC. Serious problems of authority were evident and the coordination of the departmental activity was hindered.

However, in Maxwell, the authority structure was altered as a result of prior planning. Nevertheless, problems emerged as police officers were separately dispatched and assigned tasks from two separate command posts, a staging area, and the county communication center. An overlap of command responsibilities developed and the tasks were fragmented in such a manner that it was not always clear who had authority for specific actions.

The problems in the other police departments were not as severe. They ranged from some conflicting directives being given by field commanders, the field command post or the EOC, to simply a difficulty at times in locating key organizational decision makers.

Social scientists have long recognized that authority cannot be imposed upon others. It is either located within traditional group positions or is a result of personal influence. It is where subordinates unquestioningly acknowledge and comply with the directives of superordinates, and is a relationship that tends to evolve and become established over time. The sudden alteration of a traditional authority structure can create situations of uncertainty for any organization, including police departments. During disaster, the sudden imposition of a nontraditional authority structure of multiple control

centers can prove to be quite disruptive to organizational coordination. We are not suggesting that some alterations in normal everyday authority arrangements are not needed and beneficial for organizational disaster response. However, it is our impression that such alterations need to be planned, exercised, and understood by all personnel, if there is to be acceptance of the new authority arrangements in a disaster context.

The Decision Making Process

The previous DRC studies found that decision making is altered most dramatically during the "mass assault" phase of disasters, that is, during the very earliest period when convergence is occurring. The current case studies support that observation. With the alteration in authority arrangements, the massive influx of personnel, and the perceived urgency for response, decision making tends to initially be diffused throughout the organization. Essentially there is a considerable decentralization of decision making in the police department.

Officers often take individual initiative for actions that may subsequently prove not to have been functional or appropriate. Only later, with the acceptance of the nontraditional authority, or, perhaps even later, when the department returns to normal operation, does the decision making process become more centralized.

Not unexpectedly, those departments which underwent the greatest alterations in the authority structure also experienced the greatest changes in their decision making processes. The consequences can be both positive and negative. As to the former, sometime this leads to urgent tasks being attended to instead of waiting for a decision to

come from the organizational top or elsewhere. On the other hand, because those acting frequently have a limited or no view of the overall disaster situation, counterproductive or contradictory actions may be taken given the diffused decision making.

Communication Channels

The prior DRC studies reported a dramatic increase in the volume of communication messages that flow throughout a department during a disaster, and that this increase can pose several problems for the police. The heart of the communication flow within a police organization is the communication center. While normal incoming minor calls typically tend to decrease during the emergency period of disasters, the sheer volume of total calls, dispatches, and requests for information rises significantly. The system can become overloaded which can seriously hamper organizational operations. In addition, problems regarding information flow can occur between field command posts, EOCs and the communication center. Furthermore, officers in the field often find it difficult to communicate with each other. The data from the more recent case studies indicate that these earlier made observations about the police in disasters are still valid.

DRC observed a variety of communication problems at a number of the disaster sites. In Bunkus, Maxwell, Trotter and Richdon the police departments were beset with a variety of communication-related difficulties. In Bunkus and Maxwell, the communication systems were overloaded, equipment failed or was damaged, and coordination of departmental activities was markedly hindered. Trotter also faced an

overload problem on its emergency channels, while Richdon had a technical problem of "dead spots" in its system.

Interestingly, only in two of the smallest departments and in the largest police organization were communication difficulties few in number. In Norwood, there were few difficulties, perhaps due to the limited amount of stress that was placed by the focused disaster upon the massive police force involved. In the smaller communities of Carbon Hill and Astor the events did not damage or destroy police communication facilities. In addition, the small size of the forces allowed for alternative modes of communication that appeared to be adequate.

However, in those communities that experienced extreme stress and demands, and, in those with massive police forces, police communication problems were more likely to arise. Where these difficulties occurred, the coordination of departmental activities was hindered. While communication is not synonymous with coordination it is essential for integrative organizational activity.

Finally, there was a problem with respect to resources. In most of the disasters, there was no overall shortage of resources. In fact, there was in almost all cases a surplus of personnel and equipment. But this surplus also compounded the coordination of departmental activity. In Norwood, Maxwell, Bunkus, and Trotter it was difficult to maintain contact with the various responding officers and to know the location of various pieces of equipment. This pattern of "overkill emergency management" not only creates the problem of congestion at the disaster site and the filter areas around the site, but also places

additional burdens on communication officials and command officers with respect to inventory.

In sum, with regard to intraorganizational adaptations, the findings from the previous research have been found to be still valid. The previously noted alterations in authority structure and their associated problems still plague the response of police departments. Fire Departments.

Previous DRC studies indicated that, although fire departments undergo some alterations in their internal activities and structures during disasters, these alterations do not usually produce major intraorganizational problems. Although some alteration in authority and decision making patterns, communication channels, work schedules and logistics can be observed to occur, they do not create problems of the severity and magnitude that can be seen in other types of groups that respond to disasters. Primarily, the typical predisaster structure of fire departments, including their 24 hours around the clock operations, their use of volunteers, their normal task group orientation to organizational activity, their traditional practice of having line personnel work under direct supervision, and their normal clear definition of tasks, work against the development of serious problems resulting from these alterations.

However, there are a few qualifications to the generality of these findings. When the demands upon the fire department become extreme and stress is high, some intraorganizational difficulties will appear. But as previously noted, these problems involve such matters as logistics

and adequate resources, i.e., low water pressure, the lack of appropriate equipment, etc. In the main, the source of the problems are technical not social.

In order to determine if these previous observations are still valid, we discuss the intraorganizational response of fire departments along the same dimensions that we utilized in the discussion of police departments.

(1) Alterations in Activities and Practices

Fire departments appear to undergo fewer alterations in work activities and practices than do police departments. Concerning the assignment of priorities to demands, the data from the eight case studies indicate that fire departments almost always assign highest priority to fire suppression. With the exceptions of Bunkus (in which the only fire developed late in the emergency period) and Richdon (in which fire suppression was not undertaken until identification of the toxic chemical could be made), in all instances fire departments first turned their attention to their primary task. In Maxwell, Norwood, Trotter, Solara Beach, Carbon Hill and Astor, fire suppression was the primary activity. Other tasks, such as search and rescue in Maxwell, were sometime also quickly undertaken. However, in no instance was fire suppression sacrificed for the completion of other activities.

In addition, the reallocation of organizational personnel presented few problems because the great majority of departments simply did not internally move their work force. Where reallocation did occur, it was successfully managed. Richdon, for example, utilized with

considerable success its Fire Prevention unit in the evacuation process.

Similarly, except in Bunkus, the recalling and redeploying of fire field personnel was well managed. The response time in all of the communities was impressive; units arrived within minutes after learning of the event. Even in Bunkus, there were no major problems with mobilizing the existing force. In Norwood the redeployment of personnel was well managed. Additional firefighters were brought from staging areas to relieve on duty personnel in order to limit possible psychological stress. In general, once units were involved in a task at the disaster site, they remained at that activity. Only in Bunkus, where communication problems made it difficult to contact all units, were there any significant problems with redeployment.

It is possible that the few problems we noted in this area may be a result of two factors. First, fire departments, including those in these case studies, tend to withdraw quickly from disaster tasks. Therefore, extensive organizational redeployment and relief are often unnecessary. (But in disasters of prolonged involvement the relief and redeployment of personnel could be far more problematical.) Second, the massive fire organizations in a number of the communities studied were not stressed by the event. They had adequate personnel to handle the demands of the disaster, and they did not have to be concerned about coping with the situation.

With regard to adding extraorganizational personnel, none were added to any of the fire departments in the eight disasters we studied. In the larger departments there was a surplus of personnel. In the

smaller departments, responders coming in on mutual aid agreements assisted the local organizations.

Finally, with respect to reducing and delaying normal tasks, we found that all normal fire runs and fire service continued to be provided in each of the communities. In the smaller departments, such as Carbon Hill and Astor, mutual aid responders covered usual fire suppression activities during the disaster period. In the larger departments, the noninvolved personnel and resources were adequate to handle any non disaster calls. Coincidentally, none of the departments had to deal with a major fire during the period of the disasters; only small structural fires and emergency calls were received.

In sum, fire departments showed fewer types of organizational alterations than did the police. We would hypothesize that the lack of alterations results from fire organizations limiting themselves to their traditional tasks, their relatively rapid withdrawal from disaster activities, and the extensive resources that were available to a number of the departments.

(2) Alterations in Intraorganizational Structure

The Authority Structure

Although alterations in the normal authority structure of fire departments do not appear to be as drastic as those we observed for police organizations, some alterations did occur. These kinds of changes, when they were developed in an ad hoc fashion or had not been facilitated by adequate planning and training, can create problems similar to those we noted for police departments.

Most of the departments DRC recently studied did not dramatically alter their normal authority structure. They continued to operate through companies, alarm units, and captains and battalion commanders. The major alterations in the smaller departments involved the establishment of field command posts, a non typical operational arrangement for them. (Although even this alteration was somewhat resisted in Bunkus, where all operations were managed from the central fire station and those firefighters engaged in search and rescue activities were simply sent to find the police mobile command posts.) In the larger departments more extensive alterations could be observed. In Richdon, Norwood, and Maxwell, field command posts and staging areas were established. The latter two departments also implemented their Incident Command Systems. However, these systems are also utilized to some degree during normal fire suppression activities.

We observed discernable difficulties with the exercise of fire authority in Bunkus, Maxwell, and Astor. In Bunkus, the problems resulted from the great demands upon a small department that exceeded its organizational capabilities. Authority and decision making became diffuse. In Maxwell, there were authority difficulties stemming from the existence of multiple commanders operating at diverse locations. Although the on site command, following the Incident Command System planning, was finally placed with a Deputy Chief, various other ranking officers were involved in dispatching and allocating personnel and resources at the disaster scene, the field command post, and in the county communication center. In Astor, some authority conflicts developed between the volunteer firefighters, who only respected the

authority of the local fire chief, and the professional personnel who deferred to the authority of the Fire Marshall, who was supposed to be the commanding officer in the situation

The Decision-Making Process

With alterations in authority relationships, there were some alterations in decision-making, namely three areas: resource mobilization, logistic arrangements, and emergency management.

With regard to resources, there were generally two types of problems. First, some departments lacked specific resources, such as breathing apparatus, heavy duty equipment, and certain kinds of transportation vehicles. The lack of these specific items was observed in Carbon Hill, Solara Beach, Trotter, Richdon, and Maxwell. Although the acquisition of these resources took some time, the problems were relatively minor and were effectively solved.

Second, a number of departments simply had too many usable resources due to the massive convergence of personnel and vehicles upon the disaster site. This problem was much more difficult to handle. In all of the communities except Carbon Hill and Richdon, convergence and congestion presented difficulties not only of movement and access to the disaster site, but also problems of inventorying, utilizing and coordinating the resources.

Third, logistic arrangements presented difficulties at a number of sites. For example, staging areas were either not established at certain locations, such as Carbon Hill, or they were too distant from the disaster scene. The location of field command posts posed some

problems in Astor and Richdon since they were very near to the potential toxic spills and were potentially in jeopardy themselves. The problem of coordinating and inventorying the massive influx of ambulances and outside equipment upon the main fire station in Bunkus was demanding. At other locations, the basic logistical problems were managed adequately.

Finally, there were instances where some of the ranking officers forgot that their appropriate role, whether in terms of normal structural arrangements or of disaster planning, is one of emergency management and not emergency response or operations. While not abdicating their decision making role, these commanders, on occasion, became involved in direct fire suppression or search and rescue activities. As a result, they were sometimes difficult to locate by others and had removed themselves from central linkages in the communication and the information acquisition systems of their organizations.

Communication Channels

As with the police, fire departments had serious communication problems at a number of the disaster sites, and the problems were of a similar nature. In general, the larger fire organizations, and those that underwent the greatest stress, experienced the most severe communication difficulties. Departments in Trotter, Richdon, Norwood and Maxwell all had problems of overload, while the one in Bunkus also lost generating power for its equipment. As the case studies indicate, communication difficulties tended to be associated with problems of coordination.

In general, the fire departments we studied did not undergo as severe alterations in their intraorganizational structures as DRC found for police departments. However, while certain logistical and resource problems were observed, as was also reported in the earlier research literature, the changes and difficulties were not limited to these areas. For a number of the departments the intraorganizational response, though hindered by some problems, was basically effective and efficient. Of course, for most of these fire groups, the disasters were not of a magnitude that exceeded their resources or placed great stress and task burdens upon them for extended, long term activity. Nevertheless, where the demands were of longer duration and more extensive, greater intraorganizational alterations and problems were observed.

4. Interorganizational Adaptations During Disasters.

POLICE AND FIRE DEPARTMENTS

We depart from our separate discussions of police and fire departments with respect to this dimension. Previous studies indicate that police and fire departments have similar interorganizational adaptations and problems during disasters. Furthermore, some of their major interorganizational linkages and problems are with each other.

Both local community police and fire departments usually operate as established or Type I organizations who are highly protective of their group boundaries and domains. During normal everyday operations both of these organizations act with considerable autonomy. This independence of action, however, is significantly altered during the emergency period of major disasters. Such events alter the social

environment, making it a turbulent one. This typically results in considerable demands upon the resources of both police and fire departments as well as on the community as a whole. A collective or overall effort to meet the problems of the disaster is generally needed. Police and fire organization usually become part of this collective as opposed to independent action. Interorganizational relationships increase with a variety of local and non local groups.

The previous work of the DRC has shown that, while these increased interorganizational relationships are beneficial in many ways (particularly those mutual aid arrangements that provide needed personnel and equipment), they also create a number of problems of communication, coordination, resource allocation and exercise of authority. A major factor magnifying these difficulties is the continued attempt on the part of both police and fire departments to maintain their independence from control by other organizations, to protect their traditional domain and tasks, while at the same time attempting to play major roles (if not the major role) in the collective and overall organized community response to the disaster.

We examined interorganizational relationships in the following areas: 1) local police-fire relationships, 2) relationships with other local organizations, 3) relationships involving mutual aid and other police and fire departments from outside the community, and 4) relationships with other organizations and volunteer groups from outside the local community. Our recently gathered data clearly indicates that interorganizational problems of one form or another occurred in every disaster studied.

(1) Local Police-Fire Relationships

The primary observation from the case studies is that the local fire and police departments engaged in remarkably little interaction with each other (particularly as organizations, somewhat less so for individual organizational members contacting one another). Each department also continued to attempt to control their domain and maintain their autonomy. This lack of interaction can result in weak overall coordination and, in some instances, intergroup conflict.

The lack of interaction and coordination among police and fire department was seen at a number of the disaster sites. In Carbon Hill, the units worked quite independently throughout the fire and the evacuation, each undertaking its own traditional tasks. The problems in Solara Beach were more severe. Each department developed its own independent field command post. The lack of coordination was evident when firefighters were initially detained from entering the burning hotel by police officers who were manning inner perimeter security points. In addition, there was confusion among the responders over authority, with some believing that the Fire Chief was overall site commander, while others thought that the Police Chief performed this role.

Similar problems were observed in Norwood and Maxwell. In the disaster at Norwood, the fire and police departments established separate command posts that were considerably distant from each other. They could not communicate directly, and had to rely upon runners. Also in Maxwell, separate command posts were established after some debate over which of the responding units would use the county mobile

van. Although the two posts were in close physical proximity, they tended to work independently. In fact, we would suggest that some of the massive convergence and traffic problems that resulted at both these sites were partially the result of the lack of in depth coordination between the fire departments (who were mobilizing and dispatching large numbers of personnel and vehicles) and the police (who were handling traffic and crowd control)

In other communities, although interaction among police and fire personnel occurred in the field, there were problems of communication and coordination among the organizations. In Bunkus, there was no direct communication between the police dispatch room and the main fire station. Also, personnel from the two departments could only communicate in the field on a face-to-face basis. In Astor, communication difficulties between the departments were evident.

Richdon, which has a Public Safety system, was one of the few communities in which DRC observed any significant degree of good interaction and coordination between police and fire units. It could be argued that the Public Safety arrangement, which links the police and fire departments into one division during normal operations, is one structural mechanism that facilitates positive police-fire interaction during disaster. It is a normal day-to-day organizational arrangement that has beneficial effects during disaster.

This general lack of coordination and interaction between police and fire departments must be placed in the context of the disaster planning that has taken place in some of these communities. Even when planning has been undertaken by these two organizations, as we noted

previously, it had been intraorganizationally oriented. The police and fire plans developed had maintained the autonomy and domain of the organization and did not do an adequate job of integrating the separate planning. In those communities in which planning had not occurred, the lack of interaction during disasters is understandable in that the police and fire departments simply responded in their normal autonomous fashion.

(2) Relationships With Other Local Organizations

Relationships with other local organizations, while more extensive than during normal times, were also rather limited. In a number of communities, the police and the fire department relationship with the local emergency management agency (LEMA) was very indirect and superficial. In Bunkus, Norwood and Maxwell, the LEMA was either ignored, uninvolved, or viewed as handling disaster tasks not directly related to the primary activities of the police or fire departments. In most of the remaining communities, the LEMA was in charge of the overall task coordination for the community; however, both police and fire departments tended to view that activity as peripheral to their domain and primary tasks.

In most of the other disaster sites, limited interaction took place with other local organizations. Some of these were mutually beneficial, as in Bunkus, where the public works organization assisted with debris clearance, and in Solara Beach, where relationships with relief agencies were well managed. However, in those cases where there were large numbers of casualties, such as in Bunkus and Maxwell, the relationships between fire and police organizations at the disaster

scene and receiving hospitals were marked by some difficulties. In both communities, many hospitals received incorrect or misleading information regarding the number of casualties that might be sent to them. Also, information regarding the number and types of casualties that had occurred in the disaster was difficult to obtain.

In Richdon, the only major interorganizational problems that occurred at the local level involved the local transportation authority. This authority was heavily involved in emergency response activity. Yet it had been excluded from previous disaster planning efforts (or any afteraction analysis) by the Public Safety division and its police and fire units. Although the Public Safety arrangement appears to be beneficial in limiting interorganizational problems between police and fire units, it still allows for difficulties when the organizational relationships extend beyond the parameters of its normal structure.

In sum, consistent with the normal independent activities of police and fire organizations, their interactions with other local groups during disaster tend to be rather limited. In particular, they have little contact with LEMAs. This left the LEMAs often unsure of what was actually happening overall. To the extent that LEMAs are responsible for overall community response and coordination during the emergency period of most disasters, their lack of knowledge about what first responders in particular were facing and doing, created an information void. Hospital too sometime do not get the information they need to properly mobilize. The social isolation of such critical organizations as police and fire departments can pose problems for

other local community organizations with coordinative and other responsibilities in disasters.

(3) Mutual Aid Arrangements with Other Police and Fire Departments

Mutual aid arrangements are obviously beneficial and necessary for most police and fire department operations during disaster. Those outside units that respond can provide needed personnel and resources to both respond to the disaster and to "cover" any geographical areas that are left unattended by local responding units.

DRC observed mutual aid relationships in Carbon Hill, Astor, Bunkus, Trotter, Norwood, and Maxwell. However, the nature of the relationship varied by the disaster locales. In both Carbon Hill and Astor, mutual aid relationships were cooperative and beneficial. In Carbon Hill, the outside units provided coverage for the city while the local department fought the blaze at the factory. Also, the "auto-aid" system in Norwood worked effectively, as outside units were used as elements of "strike forces" to relieve on duty responding units. In these communities, the very positive relationships with other departments with which there were mutual aid agreement stemmed from normal day-to-day interaction of the departments in firefighting activity, or a clear delineation of tasks between the local unit and the mutual aid responders.

However, we noted some interorganizational problems with the implementation of mutual aid agreements in Trotter, Maxwell and Bunkus. These problems indicate underlying difficulties in communication and authority relationships that are inherent between organizations with

strong orientations toward domain control and autonomous action, and who do not regularly interact. In Trotter, the interorganizational problem of the police was a lack of communication among three responding agencies. With the local city police department and the county agency unable to communicate, a condition arose in which each department was making separate requests for mutual aid implementation to different outside organizations. At one point one department had an excess of personnel while the other was requesting more assistance. The mutual aid relationships among the fire departments in Trotter were based upon a lack of interaction. Both the airport and local fire departments responded to the plane crash. They both engaged in autonomous fire suppression activities. While this independent response did not create any serious problems in Trotter, it is a pattern that could prove to be problematical in an event with more extensive demands.

In Maxwell, mutual aid relationships were generally positive. However, at times there was a lack of coordination among the responding units and conflict over authority. For example, the police department was faced with the fact that outsiders who had responded on the basis of mutual aid agreements, withdraw from the site when their commanding officer left, without any notification or clearance from the Maxwell police. The fire department also had some difficulties with mutual understandings concerning terminology and authority.

Bunkus was deluged with outside responding agencies. The fire department, however, found that outside agencies were reluctant to engage in fire suppression activities within the city. Neighboring

communities who provided police services also tended to operate independently during search and rescue activities. Although they provided advice and assistance to the local units, their response was not tightly coordinated with the local police search and rescue efforts.

Unless local units work extensively with outside agencies on an everyday basis or integrate their planning with outside units, problems of coordination in response will occur. As we have found before, incompatible communication facilities, terminology, equipment and authority structures sometime exist. They can and do create problems for emergency response.

(4) Relationships with Other External Organizations and Volunteers

With the exception of other police and fire departments, local police and fire units tend to limit their interaction with other organizations from outside the community. Only when they need the assistance of outside units, or perceive that they must conform to legal and procedural expectations from outside agencies, do they interact with any frequency. In short, just as police and fire departments tend to keep themselves apart from other local community groups, they tend even more to stay away from non community organizations which may come in to help in a disaster.

As to seeking assistance, the local fire departments in both Carbon Hill and Richdon sought the help of outside organizations in identifying the nature of the toxic chemicals involved at the disaster site. The results, in both cases, were less than efficient. In Carbon

Hill, neither federal nor state agencies were able to assist the local fire department in determining either the nature or toxicity of the chemical or in monitoring air quality. Fire officials in Richdon also experienced difficulty in determining the nature of the toxic spill. Both departments probably acted very appropriately in delaying fire suppression activities until the chemical risk could be determined; but their search for outside assistance was less than satisfactory.

As to compliance with outside directives, we noted that the fire department in Norwood altered its normal fire suppression procedures in order to meet its perception of the needs of the NTSB at the site of the plane crash. A similar concern was evident in Trotter.

Finally, many of the police and fire departments faced the problem of outside citizen volunteers coming to the disaster site. The common pattern of response was to try to keep them from arriving. Given the massive convergence of professional emergency personnel and forces upon disaster scenes, this activity is understandable. However, it does indicate the strong reluctance to utilize any volunteer personnel in police or fire activities.

In sum, interorganizational problems were observed at all of the disaster sites. The major difficulties were in the interactions between local police and fire departments. Fairly serious problems of domain, authority, communication and coordination were evident between the local units at a number of sites. Problems with other than police and fire groups were less severe. But there were structural impediments to a coordinated response imbedded within mutual aid agreements.

The findings from previous studies are largely supported by our more recent observations.

5. The Incident Command System.

As we previously noted, the Incident Command System was developed in an attempt to limit intraorganizational problems and bring effective emergency management to fire operations. The system was initially developed by FIREScope to handle the problems of massive forest fires. It has since been refined, altered and diffused throughout the country as a model command system that has application beyond firefighting activities. It represents the major structural change that has occurred in fire department operations during disaster since the previous studies.

For the purpose for which it was designed, the Incident Command System is probably quite effective. When used in broadscale, diffuse disaster settings, such as brush and forest fires, it should manage problems involved in logistics and operations. Because it was created by a combination of representatives from various fire departments, consensus on a standard terminology and authority structure can aid coordination among mutual aid responders. Its use of staging areas, strike forces, and the sectoring of the area are ideally suited to broadscoped disasters that have an extended period of impact, such as forest fires. (We should temper our remarks however by noting that DRC has not directly studied the use of the system in actual brush and forest fires, but the existing literature supports the value and validity of its use in such situations).

However, the model has been proposed as a general command model for fire departments, emergency medical services, and other emergency groups responding in all types of disasters. It has many advocates who see it as a panacea for all emergency management ills. It is therefore relevant to ask if the "Incident Command System" is the ideal model for all emergency management?

Our case studies and observations indicate that there are a number of serious problems with the "Incident Command System". Two of the fire departments had planned for the system fairly close to how it is often ideally depicted and they also operationalized it during the disasters DRC studied. Other departments we looked at talked about "incident commanders," but did not truly utilize the model; nevertheless, it was a part of the thinking of many of the fire groups which we researched. But the empirical findings from the more recent DRC research (as well as our general review of the existing literature and accounts of the system in operation) indicate that not only are there inherent problems in the "Incident Command System", but it can actually contribute to serious difficulties in emergency response. The following difficulties have been observed to be inherent in the system or to be associated with its diffusion.

First, the concept of an "Incident Command System" has become a "buzzword" within emergency management and fire agencies that bears little relationship to any actual detailed management model. For example, many local fire departments, including the Bunkus department, claim to use the "Incident Command System." However, during actual emergency or disaster operations the plan is either ignored or is

utilized in a very limited fashion. For some departments, the "Incident Command System" simply means that "someone is in charge." The important structural elements of the system, such as sectoring, staging areas, strike forces, tactical forces, and task divisions among operations, planning, tactics, and finance are ignored or not actually incorporated in preparedness activities. However, as we shall shortly discuss, the simplistic notion that if one individual is commanding the site, then the emergency is being well managed, can present serious difficulties. Furthermore, while many departments have some knowledge of the concept, few understand the complexities and purposes of the system. (Our use of quotation marks is partly to indicate that the referents of the term are rather heterogenous and it is a major mistake to assume that everyone is talking of the same things when they allude to an "Incident Command System").

Second, the one component of the "Incident Command System" that is often selectively adopted is the weakest element, i.e., the shift of "command" from officers of lower rank to those of higher rank to those of senior status, and the subsequent reversal of this pattern. The "Incident Command System" is based upon the "bumping" of authority both up, from the initial responders to those officers of higher rank, and down, when higher ranking officer leave the scene. In the theoretical planning of the system, this "bumping" is discretionary, and a lower ranking officer who is among the first responders may remain in the position of "Incident Commander." However, this pattern of "bumping" authority is a blueprint for the loss of information and effective management. Information collection and analysis is a problem in all

disasters. Although the design of the "Incident Command System" proposes that a complete briefing of all relevant information should be given to the new "incident commander" by their predecessor, in actuality, the system is structured to lose information. It is very difficult for any one official in a command position to collate and remember all pertinent information during the emergency period of a disaster in which communication lines are overloaded and individuals are providing whatever information they have available, to the command post. An adequate transferral of this information to another official, who must pass it on to others, is very difficult. (It might be recalled that in Norwood and Maxwell the position of "incident commander" changed a number of times.)

Third, even when the system is understood and implemented, it suffers from being an intraorganizational plan that does not provide for an interfacing or integrating of activities with relevant outside organizations. In most communities that utilize the system, it is viewed as a model for command of the fire, or, in some cases, emergency medical services. Because of its assignment of one official to the highest command position and its limited attention to any liaison activities, it gives the impression that the fire department, or whatever organization is utilizing the system, is solely in command of the incident. It is not a matter of coincidence that in both Norwood and Maxwell separate command posts and operations were established by the fire and police departments. The "Incident Command System" plan in Maxwell, for example, does not mention the integration of command activities with other organizations. This type of emergency management

model does not overcome the serious problems of interorganizational coordination that empirically have been observed during disaster conditions. In fact, it contributes to them.

(Of course some proponents argue for the concept of "joint command" with other units. However, this plea is actually nothing more than a request for liaison or command personnel to assemble at an EOC. In actuality, "joint command" was not implemented at any of our disaster sites. The system, in effect, fragmented the response across responding agencies.)

Fourth, because of its primarily intraorganizational orientation, the "Incident Command System" does not encourage integration of activities with a variety of local organizations, such as LEMAs, relief agencies, and volunteers. In the case of LEMAs, this lack of integration can engender conflict over authority for the disaster response. Community wide planning normally assigns a key role to the local emergency coordinator or their designee to assure overall coordination. But other plans and authority relationships are taken little into account by the "Incident Command System", and is based upon a strong notion of internal command of all operations. This arrangement may be appropriate to purely or primarily fire suppression activities, such as in forest and brush fires, or to those types of disasters where only limited involvement is required on the part of any organizations other than the one utilizing the Incident Command System. However, when other types of disasters occur that require a broad ranging response from a number of different organizations, the system may work against coordination.

The system is particularly weak in effectively integrating the activities of relief agencies and volunteers. In the planning and response activities that we observed, volunteers were ignored and no attention was paid to integrating them and utilizing their skills with the response efforts of fire departments. Similarly, relief agencies were also ignored.

Proponents of the "Incident Command System" could argue that either the system allows for liaison personnel or that the issue of linkages to such groups as LEMAs and volunteers is basically irrelevant because the model is a management model designed to handle fire emergencies and coordinate personnel. With regard to the first point, it is true that liaison personnel can be structured into the system. However, in actual implementation, that occurs to only a marginal degree, and, as was seen in the case studies, fragmented command structures and a lack of coordination across organizational boundaries is a consequence. Concerning the second point, it is true that the model may be effective in handling a specific problem that can be accomplished by one type of organization, such as fire suppression. However, to develop a model that is primarily self contained, while certainly appealing to an organization such as a fire department that normally acts with great independence, hinders overall coordination at the community level of response.

Fifth, the "Incident Command System" has problems in disasters where the impacts occur in focused, limited areas. In such settings, it appears to facilitate "overkill" mobilization of forces and create serious problems of convergence and congestion at the disaster site.

In both Norwood and Maxwell, the major problems in the disaster involved the massive convergence of emergency personnel and equipment upon the impact area, which resulted in serious traffic and congestion problems that hindered the overall emergency response. In both communities, the impact area was very focused. In both localities, the "Incident Command System" and its massive mobilization of resources appears to have contributed to the problem. Proponents of the system argue that it should be implemented in stages and that resources should be mobilized only as they are needed. That is sound advice. However, in actual emergencies and disasters, particularly in focused impact areas and those with limited access, the dynamics of the system appear to encourage an "over-response."

Sixth, the "Incident Command System" is not a panacea for typical disaster generated intraorganizational problems of communication and coordination. As the case studies indicate, even in departments that utilized the system, communication overload and problems of logistics and coordination surfaced. In Maxwell, the system was overloaded, the county communication center lost contact with responding units, and communication among the various sectors and the command posts were difficult. Furthermore, because authority may "bump" throughout the incident and the assignment and dispatch of personnel can occur from a number of locations, i.e., the communication center, the field command post, operational commanders in various sectors, etc., the planned design of a military model of hierarchical authority is more a concept than a reality. Conflicting directives, overlapping command, and confusion over decision making authority can still occur.

Seventh, unless responding mutual aid organizations have been involved in developing the "Incident Command System" and in its implementation during numerous previous emergencies, the system does not solve the problems of coordination that arise between responding units. The uniformity of terminology, tactics and authority that the system attempts to achieve may be successful within the department that has developed it. It may also be successful when used with mutual aid organizations that have been included in its development and have a "working knowledge" through actual experience with the system. In Norwood, these conditions existed and the mutual aid relationships were quite effective and coordinated. However, in Maxwell, the mutual aid responders were not as well integrated into the planning effort. Confusion over authority was evident. The situation in Maxwell is far more common than that in Norwood and, given the variety of models of the system that exist, the possibility of developing "one" model that would be utilized by all departments to alleviate this problem is not likely.

Finally, the "Incident Command System" is based upon classic "command and control" models of emergency management, as opposed to a coordinative and resource management model. It draws from military notions of "command and control", i.e., the imposition of authority from one higher level position that has overall responsibility for action, the division of tasks based upon operational considerations, close supervision of subordinates and superiors, clear chains of command, and defined separation of functions. This model may be fine for the military because it is based somewhat on its normal, everyday

structure. (Ironically, even for the military, this model during combat is far more nominal than real, as decentralized patterns of response necessarily takes over). The model may also be adaptable to quasi military organizations, such as fire departments, that are self contained and already pyramidally organized. However, communities and the great majority of organizations within them are not organized on a military or quasi-military structure. If one attempts to apply this system to the overall community response, an artificial emergency structure is imposed upon a system that is not structured to support it. Conflicts over authority, resources, and organizational domain are likely to be produced among public, private and volunteer groups and organizations. Therefore, the "Incident Command System" does not appear to be a model that is readily transferrable to broader community-wide planning and response efforts.

In sum, the development of the "Incident Command System" for fire operations has been the major change that has occurred in fire response to disasters since the previous writings. The system has many benefits and is certainly an improvement over the past practice of utilizing SOPs. For coordinating the internal activities of a quasi military organization, such as the fire department, it has some obvious strengths. Furthermore, it seems to be an effective model for dealing with the type of disasters that it was initially intended to handle, i.e., broad-scale fire events, and for emergencies that do not require extensive involvement by a variety of community organizations.

However, the system has inherent problems, not only in planning but in implementation. There is little positive evidence and increasing negative research data that it can be "the one model" that can be utilized in all disasters by all groups. Furthermore, even if it might be the best model for fire departments dealing with their typical tasks in fire emergencies and disasters, it does not follow that it is necessarily the best model for them in coping with nontraditional tasks in non fire community disasters. Before "jumping on the ICS bandwagon," careful, critical analysis of the model must be undertaken and its adoption and implementation undertaken with care.

CHAPTER 6. CONCLUSIONS, IMPLICATIONS AND RECOMMENDATIONS

In this chapter we briefly summarize our major research conclusions, indicate some implications from the work done, and make a few recommendations about disaster related activities of both police and fire departments.

The prime purpose of this study was to increase through systematic field research the currently limited knowledge base about the emergency time response of local police and fire organizations. DRC studied eight events; these constituted almost all of the major community disaster occasions involving extensive police and fire response that occurred during the time period covered by the contract agreement with FEMA. In that sense the available universe for research was covered rather than sampled.

Nevertheless, all the conclusions, the implications, and the recommendations presented are heavily drawn from the information obtained in the eight disasters studied, and as is true of any research results are therefore limited in some respect. Probably the most important qualification that stems from the data base used is that many of the occasions which DRC studied were not major disasters. The toxic spills and fires seriously disrupted community life (they all involved large scale evacuations), but they did not result in extensive casualties (dead and/or injured) or property damages which could have overburdened the local organizations in their response efforts. The transportation related disasters, although tragic in terms of loss of life, were very spatially focused situations that happened in communities with massive police and fire department

resources. Only in Bunkus where the small police and fire departments had to cope with major community wide consequences of a tornado, were the demands clearly beyond the capabilities of the responding agencies. Therefore, some caution needs to be exercised in generalizing the findings of this study to major disaster occasions, although if organizations have difficulties and problems in handling smaller scale events, as was true in several of our case studies, it does not auger well for their probable response in more demanding situations.

In our data analysis we used as a base point the previous DRC work on police and fire departments of over a decade ago, although we also considered whatever changes generally occurred in those organizations since that time. This led us to examine four primary dimensions or aspects of both police and fire groups: 1) their predisaster structure, resources and planning; 2) the organizational tasks undertaken during disaster emergency time periods; 3) the intraorganizational alterations that happened during disasters; and 4) the interorganizational alterations that also occurred.

Research Conclusions

Summarized in very general terms, our research conclusions are that with respect to:

a. Police Departments and their--

1. Predisaster structure, resources and planning.

(1). Local police units are rather similar in their basic organizational structure, although varying considerably in size and complexity depending on their community base.

(2). They have many resources potentially relevant to disaster responses, and have improved their communication capabilities in recent years.

(3). The degree of planning for major community crises varies with more of it being undertaken in the larger organizations.

(4). Such crisis planning as exists however is more emergency than disaster oriented; it incorrectly assumes that the former can be used for the latter.

(5). Even when there is disaster planning it is almost always focused on intraorganizational matters.

(6). Prior organizational disaster experience is associated with having disaster planning.

(7). Overall, although there is now better planning for civil disturbances, there has been relatively little change in the last decade in preparing for community disasters.

2. Organizational tasks during disasters.

(1). There is a strong tendency to limit police activities to the traditional tasks of traffic control, life and property protection, search and rescue, and warning and evacuation.

(2). Traffic and crowd control is often not very effective.

(3). Pass systems are almost never established, especially when they are most needed.

(4). Protection of life and property is usually well handled, but it may be more difficult in diffuse than in spatially concentrated disaster sites.

(5). Organizing and coordinating search and rescue activities presents a variety of potential and actual problems.

(6). Usually an effort is made to withdraw the police from disaster activities as soon as possible, especially from any tasks that are not traditional.

3. Intraorganizational adaptations during disasters.

Activities.

(1). Intraorganizational alterations in activities are more likely when the disaster is extensive, where the resources of the department are few, and where planning and prior disaster experience is limited.

(2). In general, the more severe the demands and the smaller the resources of the department, the greater the difficulty in demand prioritization although assigning of priorities always tends to be somewhat problematical.

(3). Internal reallocation of organizational personnel is usually not a problem.

(4). The redeployment and recall of field personnel is plagued with many difficulties, and is compounded by the usual convergence and communication difficulties that appear after disaster impact.

(5). There is a great reluctance to use and a poor integration of citizen volunteers into organizational activities.

(6). Smaller departments have far more problems in reducing and delaying normal organizational tasks than larger ones.

Structure.

(7). Alterations in organizational structure are widespread in the immediate aftermath of a disaster.

(8). Changes in the everyday departmental authority structure, especially an informal move towards a more military model, create many problems and can lead to multiple control points which hinders effective coordination of the emergency time response.

(9). Organizational decision making typically becomes more diffuse and decentralized in the emergency time period, which however is not necessarily dysfunctional.

(10). Communication problems are widespread and information flow is seriously impaired intradepartmentally as well as to-and-from the organization.

(11). Organizational size is bimodally associated with communication difficulties; the larger and smaller departments have the fewer problems.

(12). The typical overabundance of converging resources, personnel and equipment, contributes to the information flow problem.

b. Fire Departments and their--

1. Predisaster structure, resources and planning.

(1). Fire departments have organizationally changed considerably more than police departments in the last decade.

(2). In particular, new functions have been added such as the providing of emergency medical services (EMS).

(3). Fire organizations are very heterogeneous with respect to size, work force composition and general structure, and especially relative to police departments.

(4). There has been an increase in organizational resources particularly when new functions have been added.

(5). Disaster (as compared to everyday emergency) planning has increased in the last decade, and is more likely to exist than in police departments.

(6). The planning almost always focuses on intraorganizational matters.

(7). Fire departments continue to have little experience with disasters or even large fires.

2. Organizational tasks during disasters.

(1). Fire suppression is the universal and dominant activity, and very well handled.

(2). Very serious problems typically surface in search and rescue efforts in disaster situations perhaps because of a failure to recognize there are organizing and coordination problems not involved in solo and limited similar activities in ordinary fire situations.

(3). Increasingly, there is more organizational involvement in warning and evacuation possibly because of the increase in toxic chemical incidents.

(4). Of all organizations, fire departments tend to withdraw the earliest of all from disaster situations.

(5). Fire departments overall have less problems in responding to disasters than do police groups.

3. Intraorganizational adaptations during disasters.

(1). There typically are few intraorganizational alterations by fire departments in disasters, and substantially fewer than occur in police departments.

(2). Relative to police groups, fire departments have less difficulty in adapting to disasters and exhibit relatively fewer organizational alterations.

(3). To the extent that the departmental focus is primarily on fire suppression there are few intraorganizational problems.

(4). Changes in departmental authority patterns, while not common, do occur and are associated with the establishment of field command posts.

(5). There are few changes and problems in organizational decision making; these generally have to do with resource mobilization, logistic arrangements, and mixing fire emergency management and operations.

(6). Often there are serious communication and information flow problems with negative consequences for coordination.

c. Police and Fire Departments and their--

Interorganizational adaptations during disasters.

(1). The everyday tendencies of police and fire departments to be relatively autonomous organizations who are highly protective of group boundaries and domains, extend into disaster situations.

(2). Police and fire departments often have surprisingly little organizational interaction during the emergency periods of disasters.

(3). There is frequently lack of coordination between police and fire groups.

(4). Limited interaction takes place between police and fire departments and other community groups, including the local emergency management agency.

(5). Mutual aid agreements with extracommunity organizations are generally helpful for responding and managing disasters, but are not devoid of problems with respect to communication facilities, equipment, terminology and authority structures.

(6). Local police and fire departments tend to limit their interaction with other organizations from outside of the community.

(7). The massive over response of emergency personnel and volunteers to an impacted area tends to compound the overall coordination problem.

d. Incident Command System.

(1). Increasingly, the incident command system is being adopted by fire departments.

(2). However, few departments actually implement the whole system.

(3). In whole or in part, the system is an improvement over previous fire suppression efforts.

(4). Yet, a key component of the system, the shift of command from officers of lower rank to higher rank often creates loss of information and effective management.

(5). The system has primarily an intraorganizational focus on fire departments that does not provide for the interfacing of activities with relevant local and outside organizations.

(6). The system is particularly weak in integrating the activities of relief agencies and volunteers in disasters with fire and police departments.

(7). Overmobilization of groups on disaster sites tends to be facilitated by the incident command system.

(8). Even with the system in place there can be serious intraorganizational problems of communication and coordination.

(9). The command and control model inherent in the system makes it particularly inapplicable to broader community wide disaster planning and response efforts.

Having separately summarized our research conclusions about police and fire departments, let us briefly note some of the common characteristics of the two organizations.

Overall, to the extent there has been any organizational changes, present day police and fire departments are better prepared than in the past for disasters. However, the planning is not always disaster oriented, and even if it is, the focus is almost always exclusively on intraorganizational aspects. Both police and fire groups in disasters tend to confine their activities to traditional tasks. But serious problems, such as access, congestion and coordination frequently surface and interfere with the carrying out of tasks. Intraorganizational communication problems are common. The greatest alterations for both departments occurs with the greater the demands of disaster situations. The most serious problems for both type of organizations, however, have to do with interorganizational relations. Being autonomous, self contained units that act rather independently on an everyday basis, neither their planning nor daily experience adequately prepare police and fire departments for the extensive interorganizational interactions that are necessary for an effective overall response in major community disasters.

Implications and Recommendations

Some of the major general implications of what has been discussed in this chapter are fairly clear. For one, there has to be better disaster preparedness planning on the part of police and fire departments. Good planning does not automatically turn into good managing, but it is a necessary first step.

There is also a need for both police and fire departments to recognize that adequate planning can not be instituted unless there is an understanding of what are the real problems in organizational preparing for and responding to disasters. Our case studies indicate that this knowledge does not always exist at the community level. Our research and that by others needs to become better known by disaster policy makers, planners, and operational personnel, if organizational improvement is going to be achieved.

Finally, the planning by police department has to be improved. Fire departments, influence by various agencies such as the National Fire Academy, insurance institutes, and professional associations have made major strides in improving their disaster planning. Police departments in the last decade have not kept pace with their fire colleagues. Perhaps FEMA through publications, teleconferences, workshops and programs aimed directly at the problems of police departments in disasters might attempt to stimulate local planning efforts.

Among the more specific recommendations which are implied in our research results are the following:

For both police and fire departments.

1. Both local police and fire departments should more explicitly plan for disasters over and above their planning for everyday emergencies; the two situations are qualitatively and quantitatively different from one another.

2. Police and fire departments specifically need to improve the interorganizational aspects of their disaster planning, particularly with respect to relations with one another since problems in police-fire interactions and relationships often surface in disasters.

3. The serious communication problems both police and fire departments have in disasters stem less from lack of equipment or resources but primarily from the absence of or weak predisaster planning with respect to information flow; the problem is mostly with the process and not the physical means used or available and this is what both disaster planning and emergency managing needs to address.

4. Police and fire departments ought to improve their links and interactions with non police/fire organizations since this is frequently a problematical area in disaster planning as well as managing, and can have the effect of fragmenting overall community response.

5. Departmental planning of police and fire organizations needs to take into account the almost inevitable presence of citizen volunteers and emergent groups; coordination not control of such responders is the crucial task.

For police departments

1. Police department disaster planning needs to become more interorganizational oriented; this rarely exists even when there is intraorganizational disaster planning.
2. Police department should improve their planning for traffic control at disaster sites, especially for the quick establishment of roadblocks and cordons and the effective implementation of a pass system.
3. The prevention, reduction or neutralization of the mass convergence of people and equipment into a disaster impact area is crucial because otherwise information and communication flow is impeded which in turn makes organizational and overall coordination very difficult; traffic control being a traditional police department task ought to be emphasized even more for appropriate disaster management.
4. The intraorganizational disaster planning of police departments should more specifically address how priority is to be assigned to demands and the recall and redeployment of field personnel since these activities are very problematical in most community disasters.
5. The alteration to a more military model of operations especially with respect to authority at the height of a disaster creates unnecessary and additional problems and generally is not necessary; since the move often occurs informally, considerable predisaster education and planning for higher level officers needs to be undertaken to prevent its occurrence

For fire departments

1. They should increase their predisaster interactions with other community organizations in particular fire groups and the local

emergency management agency; this will have positive consequences in managing actual disaster responses.

2. The increasing extension of fire department activities into areas peripheral to fire suppression (such as EMS) makes the need for interorganizational disaster planning even more necessary than it once was.

3. There is a need to recognize in training and planning that there are organizational and coordinating problems in major disasters which are not present in everyday fire situations.

4. Mutual aid agreements should be examined to see if they are fully applicable in managing disasters as compared to everyday emergency situations.

5. The Incident Command System, while a relevant model for particular kinds of problems in certain kinds of emergency and disaster situations, can not be applied across the board to all situations, can actually create additional problems in an emergency response, and is better for intra than for interorganizational disaster relevant issues; its general adoption for all disasters by all emergency relevant groups is not warranted by the present research evidence.

Finally, the research reported in this volume exemplifies what social science studies have consistently done for a variety of disaster relevant questions and issues. Along some lines, they provide empirical data for what is often intuitively or impressionistically believed. With respect to other matters, the studies indicate

needed qualifications on previously believed or reported generalizations. Along other lines, they suggest that certain even widely held views are not necessarily valid or at least need qualification.

In this study, DRC has done these three things for the disaster relevant behavior of local police and fire departments.. Scientific documentation has been provided for certain points. The limits of particular ideas have been indicated. It has also been suggested that certain other views need to be questioned. Given the prior knowledge base about police and fire organizations that we summarized in earlier chapters, our research findings and conclusions therefore represent a significant advance in our understanding of the topic. It is not the last word on the matter, but it is the latest available.

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